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Depositional history, environments of deposition, and hydrocarbon potential of the Newcastle Formation (Lower Cretaceous) of eastern North Dakota

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DEPOSITIONAL HISTORY, ENVIRONMENTS OF DEPOSITION, AND HYDROCARBON POTENTIAL OF THE NEWCASTLE FORMATION (LOWER CRETACEOUS) OF EASTERN NORTH DAKOTA

by

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This thesis, submitted by Gerald G. McCloskey in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

(Chairperson)

This thesis meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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ABSTRACT

The Newcastle Formation (Albian) in North Dakota is composed primarily of fine-grained sandstone, mudstone and shale. This study examined the Newcastle within the eastern two thirds of North Dakota, with the goal of determining the various depositional environments, the depositional history, and the hydrocarbon potential of the unit. A total of 2191 geophysical well logs and 21 lithologic cores were examined. Isopach maps of the Newcastle Formation and the Skull Creek Shale were generated, as was a structural top map of the Mowry Shale.

The depositional history of the unit is directly linked to the regression and subsequent transgression of the Cretaceous Interior Seaway during the mid to late Albian. The regression of the Skull Creek Seaway exposed the underlying shales to erosion, thereby allowing incision of at least one major drainage system, and possibly several smaller tributary systems in the western part of North Dakota. Sand was eroded from one or more sources, including the Dakota Sandstone, Sioux Quartzite, and Precambrian Shield, all exposed in eastern South Dakota or western Minnesota. These clastics were transported to western North Dakota and eastern Montana, and were deposited as nearshore bars and deltas, as well as channel fill.

Following a brief lowstand, the sea again transgressed over the study area, redistributing the sediments as thin sheet sandstones. Once a new highstand position was

established, nearshore and deltaic sediments accumulated along the eastern and southeastern borders of the state. These were often capped by fluvial deposits.

Again the sea transgressed, inundating the recently deposited Newcastle sediments. Deeper, quieter water conditions allowed for the deposition of the Mowry Shale on top of the Newcastle Formation.

Estimates of the hydrocarbon potential of the Newcastle Formation with Time-Temperature Indices (TTI) calculations indicate that the unit is not thermally mature enough to produce hydrocarbons within the study area.

INTRODUCTION

The Cretaceous rocks of North Dakota have not been studied in as much detail as other rock systems within the state. The Newcastle Formation provides an exception to this general rule. Although there are no outcrops of the Newcastle Formation in North Dakota, it has been studied in the subsurface by several geologists, primarily to determine its worth as a potential source of hydrocarbons within the Williston Basin.

The Newcastle Formation in North Dakota varies considerably in both thickness and lithology. It ranges in composition from a fine-grained, clean quartz sandstone to a highly micaceous mudstone. The unit's thickness and character range from thick sequences of thinly interbedded mudstones and sandstones to a thin sheet sandstone deposit. It is middle to late Albian in age, and occupies the stratigraphic position between the underlying Skull Creek Shale and the overlying Mowry Shale. The Newcastle Formation and its equivalents are present throughout most of the upper Midwest and central Canada, including North Dakota, South Dakota, Montana, Wyoming, Manitoba, Saskatchewan, and Alberta.

One reason for the lack of study of the Cretaceous rocks in North Dakota is the fact that most of them are shales, siltstones and mudstones, and detailed analysis of the units is difficult at best. Several regional unconformities are present in the Cretaceous rocks of North Dakota as well. These unconformities are sometimes discontinuous and

hard to trace from one location to another. A final hindrance is the lack of sufficient well control in the eastern portion of the state.

The goal of this study was to determine the environments of deposition and the depositional history of the Newcastle Formation in eastern North Dakota. A secondary emphasis of the study was to determine the hydrocarbon potential of the Newcastle in eastern North Dakota. The lower Cretaceous units are well suited for this type of study, due to the fact that many of them are composed of sandstones and are relatively continuous throughout the state. This study focusses on the interval between the Inyan Kara and Mowry Formations, particularly the Newcastle Formation (Albian).

A total of 2191 geophysical wireline well logs and 22 lithologic cores were used for this study. By determining the depths of the individual formation tops and unit thicknesses, both structural and isopachous maps were generated. Using these maps in combination with the detailed core descriptions, an overall depositional history was determined.

The area of study for this paper is the eastern two thirds of North Dakota. Data collection was concentrated within North Dakota's borders, in an area from longitude 102^0 W to the state's eastern border. Although the majority of the data collected were from within the state's borders, additional data were collected up to a distance of two townships outside the main study area. This was done to provide more data control along the borders of North Dakota to aid in the construction of the various contour maps. These included townships in South Dakota, Manitoba, and Saskatchewan (Fig. 1).

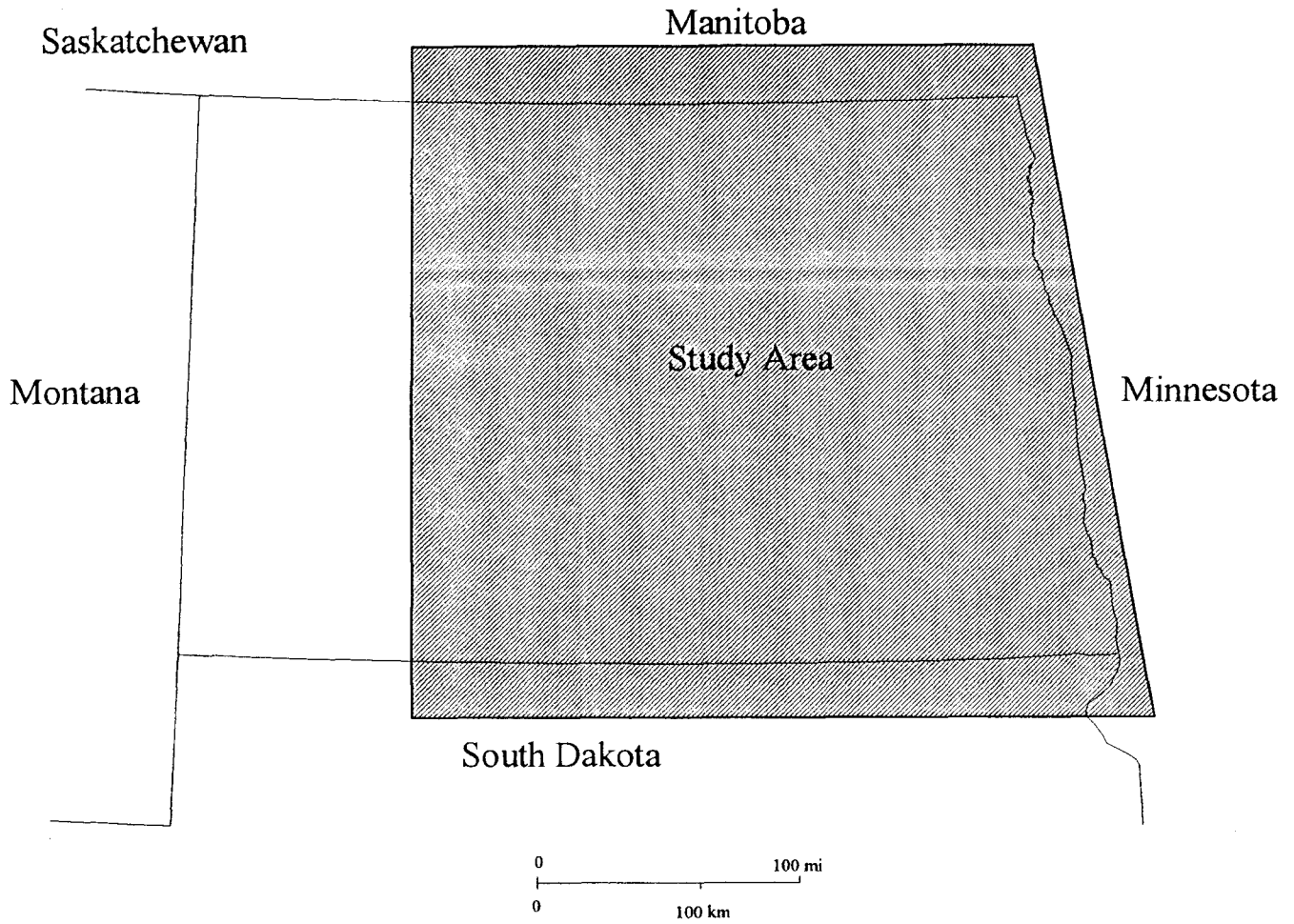

Figure 1. Location map showing boundaries of study area.

PREVIOUS WORKS

The Newcastle Formation was first described by Darton in 1909. Although he did not officially name the unit, he traced it from the interior of the Powder River Basin to the northern flanks of the Black Hills. He considered it to be a member of the Graneros Shale of Colorado.

The first large-scale study of the Newcastle Formation was that of Robert Grace in 1952. He analyzed outcrops and measured stratigraphic sections in western South Dakota and eastern Wyoming, along the flanks of the Black Hills. Grace was critical of the use of the term Newcastle Sandstone given to the unit by earlier researchers such as Hancock (1921), Collier (1922), and Summerford et al. (1950). He felt the name should be changed to the Newcastle Formation to reflect the inclusion of shale and siltstone facies with the sandstone facies. Grace's study marked the official beginning of the use of the name "Newcastle Formation" to describe these various sand, silt, shale, and mudstone units.

In 1954, Gries extended the study of the Newcastle into South Dakota. Hansen (1955) conducted a regional study of the lower Cretaceous stratigraphy in North Dakota, which included the Newcastle Formation.

Stratigraphic nomenclature problems have plagued the Newcastle from the time it was formally named. Grace's efforts to treat the Newcastle as a formation were continued

by Eicher in 1962. He performed detailed biostratigraphic analyses on the western Wyoming equivalent to the Newcastle, the Muddy Sandstone. At the time, the Muddy was considered to be a member of the Thermopolis Shale. Eicher argued that the unit was regionally continuous enough to be separated from the Thermopolis and be considered a distinct formation.

Paull (1962) worked on the depositional history of the Muddy Sandstone in the Bighorn Basin of Wyoming, while Baker (1962) studied the environment of deposition of the eastern Wyoming Newcastle Formation. MacKenzie and Poole (1962) concentrated their efforts primarily on determining the provenance of the Dakota Group, which included the Newcastle Formation.

The Newcastle Formation of North Dakota has been studied very little in comparison to the other regions mentioned above. The only research conducted on the unit has been by Anderson (1967) and Reishus (1967, 1968). Reishus' studies involved the interpretation of approximately 500 mechanical logs from the entire state and one core of the Newcastle. Anderson's research concentrated primarily on trend locations of the Newcastle, and the determination of areas that might contain hydrocarbon reserves.

Wulf (1962, 1968) proposed the idea of separating the Muddy (Newcastle) into an upper and lower unit. He felt that the lower unit, called the Muddy Sandstone, was of Skull Creek Shale age and was genetically and lithologically distinct from the upper unit, called the Dynneson Sandstone, which is equivalent to the Mowry Shale.

Further study of the Newcastle in North Dakota was conducted by Anderson in 1969 concerning the source areas of the Newcastle. Bolyard (1969), like Anderson in North Dakota, studied the Muddy Sandstone hydrocarbon potential in South Dakota.

Davies and Berg (1969) studied the detailed sedimentary characteristics of the Bell Creek Field. Biggs and McGregor (1969) also studied these sedimentary characteristics of the unit within the Powder River Basin of northeastern Wyoming, as did Schoon (1972) in western South Dakota. Both were concerned with the petroleum resources available within the Newcastle.

Regional paleogeographic interpretations that included Newcastle sediments have been done by several people. Williams and Stelck (1975) investigated the continent-scale relations of the advancing and retreating Western Interior Seaway. McNeil and Caldwell (1981) used foraminifera to track regional sea-level fluctuations throughout Manitoba and northern North Dakota. Caldwell (1982) studied basin-wide fluctuations in sea level throughout the Cretaceous as well as the paleoclimatology, biostratigraphy, and facies relations within the Williston Basin. In 1983, he extended his work into the Interior Plains of Canada. Witzke et al. (1983) also concentrated on similar reconstructions within Iowa, South Dakota, Nebraska, and Minnesota.

Vuke (1983) attempted to relate depositional environments of the Early Cretaceous to paleogeographic and stratigraphic studies of the Newcastle. Weimer (1984) used regional unconformities to help explain tectonic changes and resulting paleogeographic alterations of the Cretaceous landscape within the region; he focused on several distinct sea level changes and related them to an overall depositional model for the

Interior Seaway. Gustason et al. (1988) also proposed a depositional scenario, on a much smaller scale than did Weimer, for the Muddy Sandstone of Wyoming.

In 1991, Dolson et al. presented the idea of regional paleotopographic trends of the Muddy Sandstone and related them to hydrocarbon production. They related not only the paleogeographic interpretations but also burial history to a depositional model.

Leckie and Reinson (1993) worked with the Viking Sandstone, the western Canadian equivalent of the Newcastle. They related sea-level fluctuations directly to the depositional history of the Viking. Ryer (1993) hypothesized a Muddy clastic wedge that originated in the Northern Rocky Mountains, and extended into eastern Montana, Wyoming and Colorado.

Studies by Setterholm (1994), Shurr et al. (1994), and Dyman et al. (1994) all considered the Newcastle and its equivalent units along the eastern margin of the Cretaceous Interior Seaway. Setterholm dealt primarily with the rocks of southwestern Minnesota, while Dyman attempted to trace the depositional and stratigraphic relations of the unit from Montana to Minnesota. Shurr et al. studied the units in a much larger, continent-wide, scale. They tried to extrapolate smaller regional studies of the unit to a much larger area.

Purely stratigraphic or sedimentologic studies including the Newcastle have been done by O'Connell (1982), McNeil (1983), Rice and Shurr (1983), LeFever et al. (1991), and Pattison and Walker (1994). The most recent study of the Newcastle Formation has been by LeFever and McCloskey (1995), which described depositional history of the Newcastle in North Dakota, South Dakota, and Montana. Each of the previously

mentioned authors and their individual study areas are summarized on Table 1. A brief summary of their findings is also included.

Table 1. Summary of previous works listing authors, year of study, location of study area, and description of study.

Author (Year)	Study Area	Description of Study
Darton (1909)	Powder River Basin, Black Hills	First description of Newcastle Sandstone, measured section, described lithology.
Hancock (1921)	Mule Creek Field, Wyoming	Described general lithology and sedimentologic character of unit, suggested hydrocarbon resources available from unit.
Collier (1922)	Osage Field, Wyoming	Described lithology and sedimentologic characteristics of unit, relating them to hydrocarbon potential.
Summerford et al. (1950)	Wyoming	Suggested relationship between hydrocarbon accumulation and sedimentary facies changes within Newcastle Sandstone.
Grace (1952)	South Dakota, E. Wyoming	Suggested changing name from Newcastle Sandstone to Newcastle Formation to reflect inclusion of shale and siltstone facies into unit.
Gries (1954)	Williston Basin	Concluded that Newcastle was deposited as Cretaceous Seaway retreated northwest. Attributed variability of unit to regressive shoreline conditions.
Hansen (1955)	North Dakota	Concluded that Newcastle was deposited during lowstand conditions of the Interior Seaway. Suggested that highlands to NW, SW, and east provided sediments to unit.
Eicher (1962)	Wyoming	Performed detailed biostratigraphic analysis of Muddy SS, arguing that it should be separated from Thermopolis Shale and considered a distinct formation.

Paull (1962)	Bighorn Basin, WY	Studied depositional history of Muddy SS, concluded provenance to be unroofed clastics to west. Noted appreciable amounts of volcanic detritus within unit.
Baker (1962)	Wyoming	Concluded that depositional environment of Newcastle was that similar to an alluvial plain, but may also have been related to deltaic system.
MacKenzie and Poole (1962)	South Dakota, Wyoming	Determined provenance of Dakota Group to be Precambrian Shield and pre-Cretaceous sedimentary rocks of Western Cordilleran region.
Anderson (1967)	North Dakota	Determined trend locations of Newcastle and related them to hydrocarbon potential.
Reishus (1967, 1968)	Williston Basin	First to determine depositional environments and history of Newcastle in North Dakota. Concluded unit was deposited in nearshore, shallow marine setting, with deltaic deposits present in southeast.
Wulf (1962, 1968)	Upper Midwest	Proposed splitting Muddy SS into two units: the upper Dynneson, and the lower Muddy. Also worked with depositional environments and history of unit.
Anderson (1969)	North Dakota	Suggested another depositional model for Newcastle. Offshore currents controlled deposition in west, deltaic deposition in south and east.
Bolyard (1969)	South Dakota	Analyzed hydrocarbon potential of Muddy SS, determined that it was very favorable for production.
Davies and Berg (1969)	Bell Creek Field, Wyoming	Studied sedimentary characteristics of Muddy SS. Determined it was part of an offshore barrier bar complex.
Biggs and McGregor (1969)	Powder River Basin	Studied sedimentary characteristics of Muddy SS, and related them to hydrocarbon potential.

Schoon (1972)	South Dakota	Related sedimentology of Muddy SS to the petroleum resources available.
Williams and Stelck (1975)	Upper Midwest	Reconstructed paleogeography of region on continent-size scale, and related it to sea level changes.
McNeil and Caldwell (1981)	Manitoba Escarpment, NE North Dakota	Used foraminifera to identify regional sea level fluctuations during Cretaceous.
O'Connell (1982)	Saskatchewan	Analyzed sedimentology and facies relations of Viking SS, and related them to hydrocarbon potential.
Caldwell (1982, 1983)	Williston Basin, Canadian Interior Plains	Studied paleoclimatology, biostratigraphy, facies relations, and related them to basin-wide fluctuations in sea level.
Witzke et al. (1983)	IA, SD, NE, MN	Reconstructed Cretaceous paleogeography of region.
Vuke (1983)	Upper Midwest	Related depositional environments to previous paleogeographic and stratigraphic studies of Newcastle.
McNeil (1983)	Western Interior Canadian Plains	Studied and described stratigraphic and facies relations of Cretaceous units.
Rice and Shurr (1983)	Upper Midwest	Reconstructed Cretaceous paleogeography and determined patterns of sedimentation along western Interior Seaway.
Weimer (1984)	Upper Midwest	Used regional unconformities to explain tectonic and paleogeographic changes. Used sea level changes to construct overall depositional model of unit.
Gustason et al. (1988)	Wyoming	Proposed depositional scenario for Muddy SS, involving three separate transgressional-regressional events to erode and later re-deposit the unit.
Dolson et al. (1991)	Upper Midwest	Related regional paleotopographic trends to hydrocarbon potential of the Muddy SS.

LeFever et al. (1991)	North Dakota, Manitoba	Constructed detailed stratigraphic cross sections of Cretaceous units along US-Canada border.
Leckie and Reinson (1993)	Western Canadian Plains	Related sea level fluctuations to depositional history of Viking SS.
Ryer (1993)	MT, WY, CO	Presented idea of a Muddy SS clastic wedge present along the Rockies, related it to falling sea levels at end of Skull Creek deposition.
Pattison and Walker (1994)	Alberta	Suggested Viking SS was deposited during lowstand conditions as valley fill sequence.
Setterholm (1994)	Southwestern Minnesota	Detailed study of stratigraphy and depositional environments of the Cretaceous units.
Shurr et al. (1994)	North America	Continent-wide study of Cretaceous rocks, relating sea level fluctuations and paleogeography to stratigraphy.
Dyman et al. (1994)	MT, WY, ND, SD, MN	Detailed stratigraphic correlations of Cretaceous rocks in upper Midwest.
LeFever and McCloskey (1995)	MT, ND, SD	Related sea level fluctuations to depositional history of Newcastle Formation.

Regional Stratigraphy

The Newcastle Formation is named for its type section near the town of Newcastle, in Weston County, Wyoming (Skolnick, 1958). The original name of the unit was the Newcastle Sandstone, but has since been modified so as to include the other siltstone, mudstone and shale facies (Grace, 1952). In the past, the unit has been continually re-assigned to different groups and often considered to be only a member of certain formations, such as the Thermopolis or Dakota.

Although the unit is known as the Newcastle Formation in North Dakota, it is named the Muddy Sandstone in South Dakota, Wyoming, and eastern Montana. In Manitoba it is considered to be a lower sand member of the Asheville Formation, whereas in Saskatchewan it is known as the Viking Formation (Table 2).

Table 2. Stratigraphic nomenclature of Lower Cretaceous units throughout the upper Midwest and Canada (taken from LeFever and McCloskey, 1995).

North Dakota	Northeast Montana	South Dakota	Southeast Saskatchewan		Manitoba
Mowry Fm	Mowry Fm	Mowry Fm	Fish Scale zone	Ashville Fm (part)	Westgate Mbr
Newcastle Fm	Muddy Fm	Muddy Fm	Viking Fm		Newcastle Mbr
Skull Creek Fm	Skull Creek Fm	Skull Creek Fm	Skull Creek Fm		Skull Creek Mbr
Inyan Kara Fm	Dakota Ss	Fall River Fm	Manville Gp		Swan River Fm

METHODS

The collection of data for this study involved the analysis of geophysical well logs, lithologic cores and petrographic thin sections. The well logs and core descriptions comprised the majority of the data used for map generation. Thin-section analyses were used primarily to determine the details of depositional environments and provenance.

Manipulation of the data involved using various computer software programs including Quattro Pro for Windows (Borland, 1993), Surfer for Windows (Golden Software, 1994), and various additional programs that were designed by Dr. Richard LeFever to be used primarily for this type of study. Map generation, statistical analysis, and hydrocarbon potential analysis also relied on computer manipulation of the data. All of the well logs and core samples analyzed were provided by and studied at the North Dakota Geological Survey's Wilson M. Laird Core Library, located in Grand Forks, North Dakota.

Well Logs

The primary data for this study were taken from geophysical wireline well logs. Gamma-ray, neutron, spontaneous potential (S-P), density, caliper, resistivity, and sonic logs were available for analysis; the S-P, gamma-ray, resistivity, and neutron logs were used most often.

An original list of approximately 2500 wells was obtained from Dr. Richard LeFever. This list consisted of one well per Public Land Survey section for all known wells in the study area. Additional wells were later added to the list for unnumbered stratigraphic test holes, missile test holes, and from the surrounding boundary townships of the study site including South Dakota, Minnesota, Manitoba, and Saskatchewan. An estimated total of 2900 individual well logs were examined. As these logs were analyzed, a portion were deleted from the master list due to poor quality or because the logged interval did not include the Newcastle. A resulting total of 2191 wells were used for making maps (Appendix A). The highest degree of well control is in the western portions of the study area. Well control in the extreme eastern regions is very poor.

The following seven individual formation tops were picked from the well logs: Inyan Kara, Skull Creek, Newcastle, Mowry, Greenhorn, Niobrara, and Pierre. Along with the individual tops, the log character of the Newcastle Formation was also noted when possible. Such characteristics as the number of sand lenses present, fining/coarsening upward, degree the unit was interbedded, and uniformity were noted when the unit was thick enough to determine these characteristics.

Core

Along with the geophysical well logs, 22 lithologic cores were examined and described in detail for this study (Appendix B). Two types of cores were analyzed: whole

cores and core chips. Whole cores were not as common as the core chips, but provided a better overall record of the lithologic relations and characteristics.

When examining each core, several characteristics were noted. These characteristics include lithology, grain size, color, accessory minerals, sedimentary structures, and bioturbation. For each core the well log signatures and depths were compared with the footage marked on the core box, and any necessary adjustments were noted. Details such as location, county, and depths of formational contacts were also recorded.

Core control for the study area is very poor. Most cores were taken from one of three distinct areas: one in Emmons County, one in Griggs and Steele counties, and the other in Ramsey and Walsh counties. Most of the whole cores were preserved well and were easily described. The core chips, however, often had missing or unlabeled intervals, and were not as well preserved as the whole cores.

Computer Analyses

While analyzing the data collected for this study, various spreadsheets, error-correcting programs, and mapping software were used to process, tabulate, and manipulate the data. Quattro Pro for Windows (Borland, 1993) was used as the primary spreadsheet and database. Most of the data tabulation and manipulation was performed using this application. Structure top depths and various thickness data were computed using the spreadsheet as well. The master database includes the following information:

Well number, township, range, section, quarter, county, Kelly bushing elevation, ground level elevation, total well depth, deepest unit penetrated by well, each formation top depth down hole for the Cretaceous units, latitude, longitude, and X- and Y-coordinates used for map generation.

Several error detection and data compilation programs designed by Dr. Richard LeFever were used to analyze the various well log data. ISODUMP was used to create separate isopachous data files for each formation for each well in the master database. It was also used to create data files of the Mowry-Inyan Kara interval, and structural tops of the Mowry Formation for each well. Each formation data file contained the well number, unit thickness, and X and Y coordinates for all the available wells in the database.

ERRORCHECK was also created by Dr. LeFever to analyze the well data. This program systematically compared the standard deviations of unit thicknesses of a series of wells within a defined radius of an individual well. If the unit thicknesses of the surrounding wells differ by more than the assigned standard deviation value, the well is placed in a separate data file that contains all wells to be checked again. CLOSEST is an accompanying program used with ERRORCHECK that determines where the three closest wells are in relation to the anomalous well. It uses the data file created by ERRORCHECK as a listing to gather the closest well data, which in turn is placed in a data file to be printed out and used along with the CLOSEST data to check the wells.

After several passes were made correcting recording errors or pick errors, maps were generated. From these maps any obvious errors missed by the software programs could be detected by drastic increases or decreases in contours of an isopach or structure

top map. These points were then checked, and any errors were corrected in the master file. This was followed by rerunning the ERRORCHECK program and correcting data, until all wells were within a ten-foot thickness error margin. Final maps were then created.

All maps for this study were created using SURFER for Windows computer software (Golden Software, 1994). Individual data files containing the well number, unit thickness or structural top elevation and individual X- and Y-coordinates for the given area were used to generate isopachous maps for the Mowry, Newcastle, and Skull Creek formations. As a way of locating erroneous data picks, an isopach map of the Mowry-Inyan Kara interval and a structural top map of the Mowry Formation were also generated. Two cross sections were assembled; one extended across the northernmost portions of the study area, and one across the southernmost reaches of the study area (Fig. 2).

Hydrocarbon Potential Study

In previous years there have been scattered reports of gas and oil shows from the Newcastle Formation. One goal of this study was to try to determine why so few wells actively produce from the Newcastle today. The stratigraphic position of the unit seems favorable; a thin sandstone between two thick shale units provides a source rock, cap rock, and reservoir for hydrocarbon accumulation. There are very few structural features that may act as traps within the Newcastle Formation in the study area. The main cause

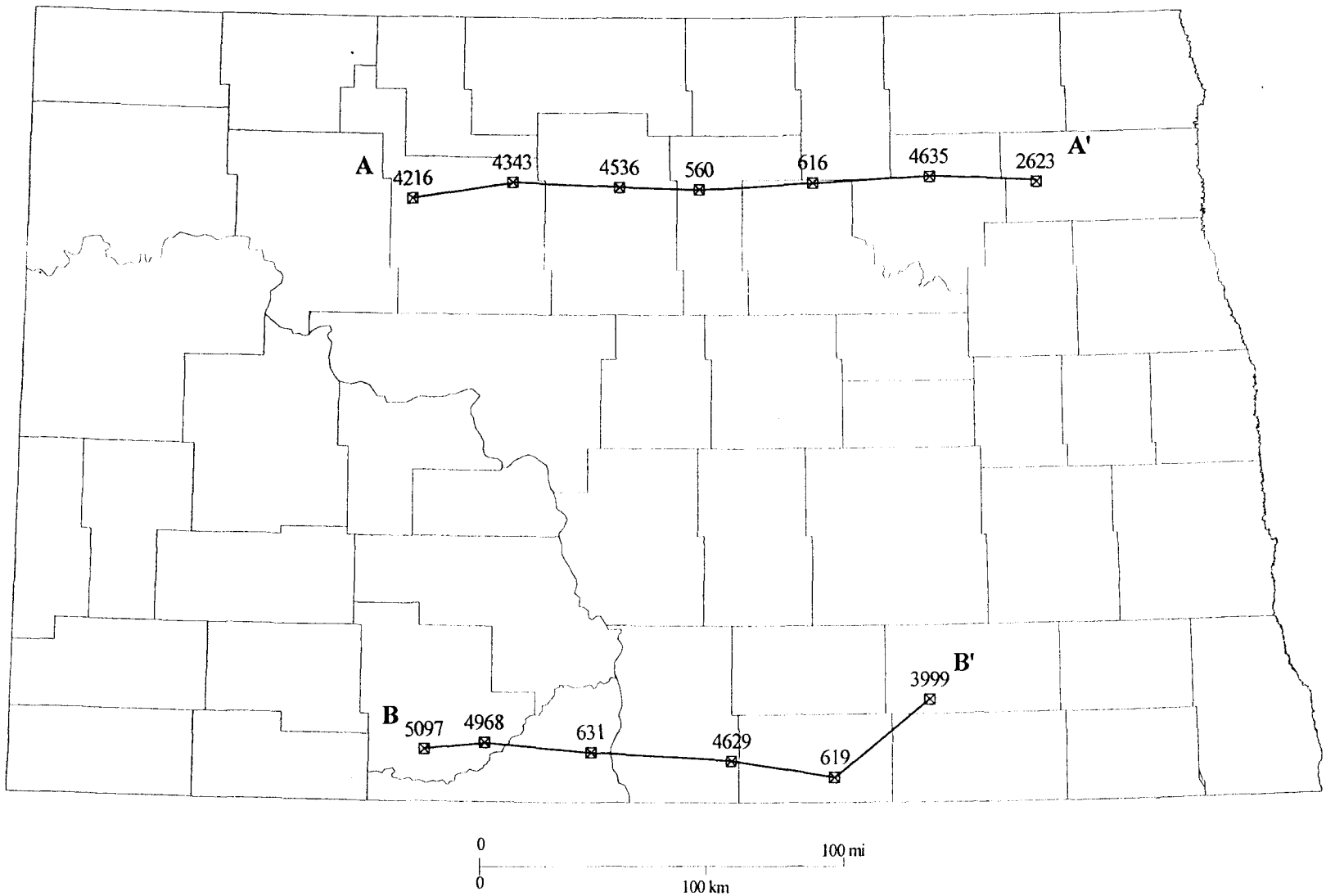

Figure 2. Map showing positions of northern and southern cross-sections, including North Dakota Geological Survey well numbers.

for lack of hydrocarbon generation may be directly related to the burial history of the Newcastle Sandstone, not the structure or stratigraphy of the unit.

Using a method developed in 1971 by N.V. Lopatin (Waples, 1980), the Newcastle Sandstone was modeled to determine its thermal maturity. The thermal maturity of a given unit provides information on both its depth and length of burial. The Time-Temperature Index (TTI) of a given well is used to determine whether or not the unit in question was buried long enough or deep enough to generate hydrocarbons.

For a small subset of the total wells in the study area, several variables were determined. The thickness of each unit was determined (in meters), as was the geothermal gradient for the well. Due to a lack of reliable geothermal data for each well, a constant geothermal gradient was chosen of 30^0 C/km. This preliminary value is thought to be an average for the study area. The data from each well were then entered into a computer program that determined the TTI for each unit.

The program used was based primarily on a published program by Elphick (1989) and Elphick and Reed (1989). The individual TTI values were computed by the program and then collected in a data file to be used by SURFER for the production of contour maps of the TTI values. These maps were then used to estimate the thermal maturity of the Newcastle and its hydrocarbon potential.

Petrographic Analysis

Provenance of the Newcastle Sandstone has never been conclusively determined. Several source areas have been suggested, including the cratonic shield, erosion of the

underlying sandy Dakota Formation, and the Sioux Uplift. Petrographic analysis was performed to try to determine the specific provenance(s).

Individual cores were selected for thin section analysis largely on the basis of location, in order to show changes in composition with distance from the proposed source areas. Specific intervals of these selected cores were chosen to show the vertical lithologic changes of the unit. Core selection was limited to whole cores due to sample size and quality of the core chips analyzed. The selected thin-section billets were sent to Quality Thin sections for processing. The finished thin sections were then analyzed for grain size, sorting, angularity, roundness, composition, sedimentary structures, diagenetic features, and porosity.

RESULTS

Maps

The data collected included formation tops of seven different units, to provide as much data as possible for the time spent analyzing the well logs. However; the thrust of this study only involved three of these units, the Mowry, Newcastle, and Skull Creek Formations. Isopach maps were generated for the Newcastle and Skull Creek Formations, as was a map showing the structural top of the Mowry Shale.

The Newcastle Formation isopach map (Fig. 3) shows several thickness trends. In the southwestern portion of the study area the unit is typically between 20 and 40 feet (6-12 m) thick. Although the isopach pattern is fairly irregular in this region, it shows a gradual thinning to the northeast, until it reaches a narrow, northwest-southeast trending area of zero thickness in the northeastern part of the study area. There are other local areas where the Newcastle is not present, but this narrow band is the largest and most continuous of any.

Much thicker deposits of the Newcastle Formation are located along the eastern and southern borders of the study area. The thickest deposits occur in the extreme southeastern corner of the area, where Newcastle sands reach thicknesses of over 220 feet (67m). The map shows a continuously thick pattern that stretches along the eastern and

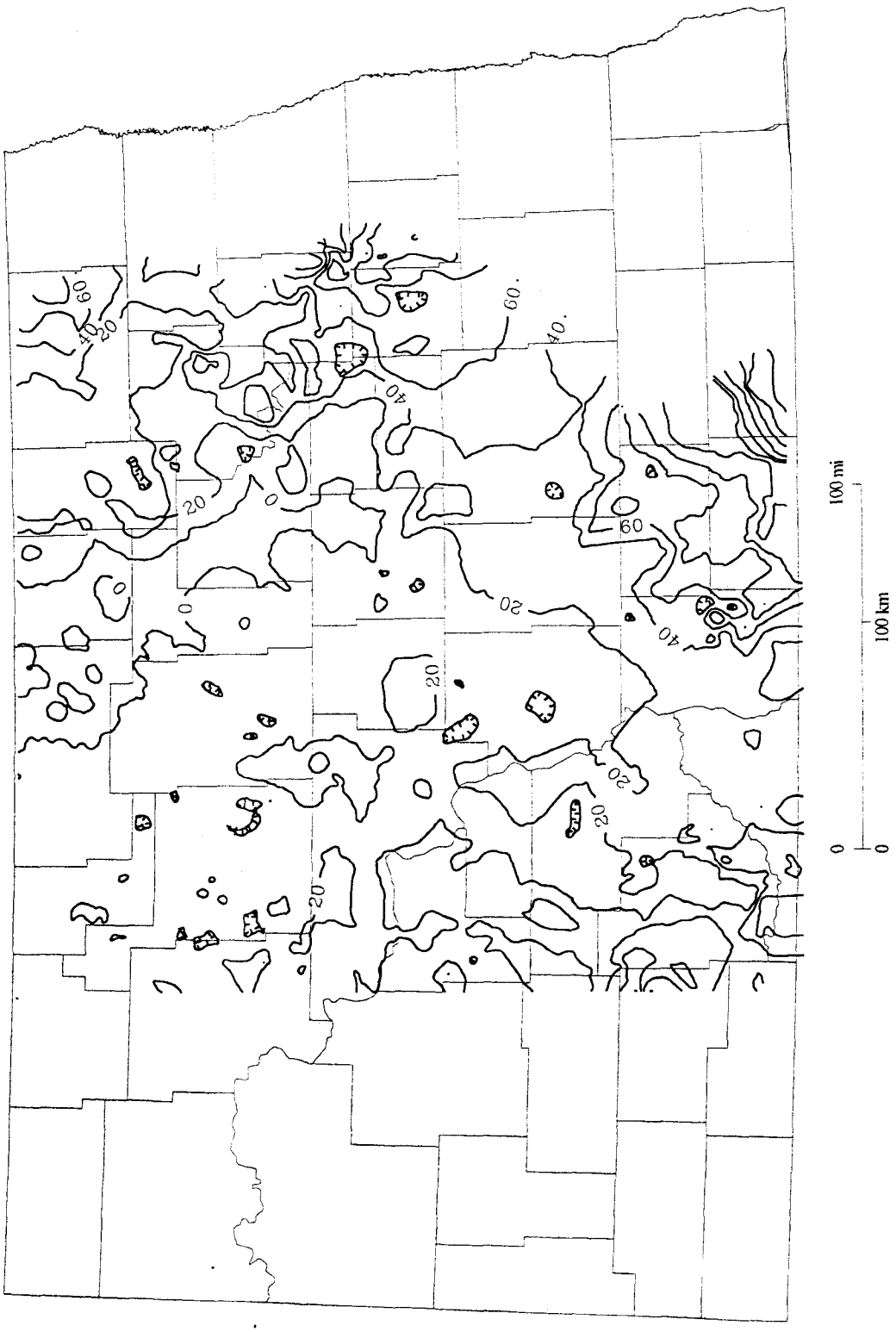

Figure 3. Isopach map of Newcastle Formation within the study area (CI=20 ft.).

southeastern boundary. This may or may not be a continuous trend. Both well and core control are very poor in the area (Figs. 4, 5); hence there is no way to tell if these thick deposits are a series of isolated sand bodies or whether they are all part of the same deposit.

The second isopach map used in the study was that of the Skull Creek Shale (Fig. 6). This map shows the unit thinning from west to east, which may be a result of either basin subsidence during deposition or depositional rates of the shale. The irregular map pattern may be the result of one or more factors. For example, as Newcastle sediments were being deposited on top of the Skull Creek Shale, differential compaction of the shale may have produced localized thick or thin pockets, shown by the irregular map pattern. Alternatively, subaerial exposure of this unit prior to Newcastle deposition may have allowed differential erosion to take place, which also would produce a distorted isopach pattern.

There are also several areas in the southern reaches of the study area where closed depressions within the Skull Creek Shale are present. The majority of these are situated in areas where there is no well control and can probably be attributed to the way the software dealt with sparse data control. The depressions could also be the result of Skull Creek deposition over underlying topographic highs of the Inyan Kara Formation.

The only structural map generated was for the Mowry Shale. This unit is the most consistent and reliable Cretaceous datum available. A structure top map of the Mowry depicts the overall structure of the basin as well as other major features such as the Cavalier High (Fig. 7).

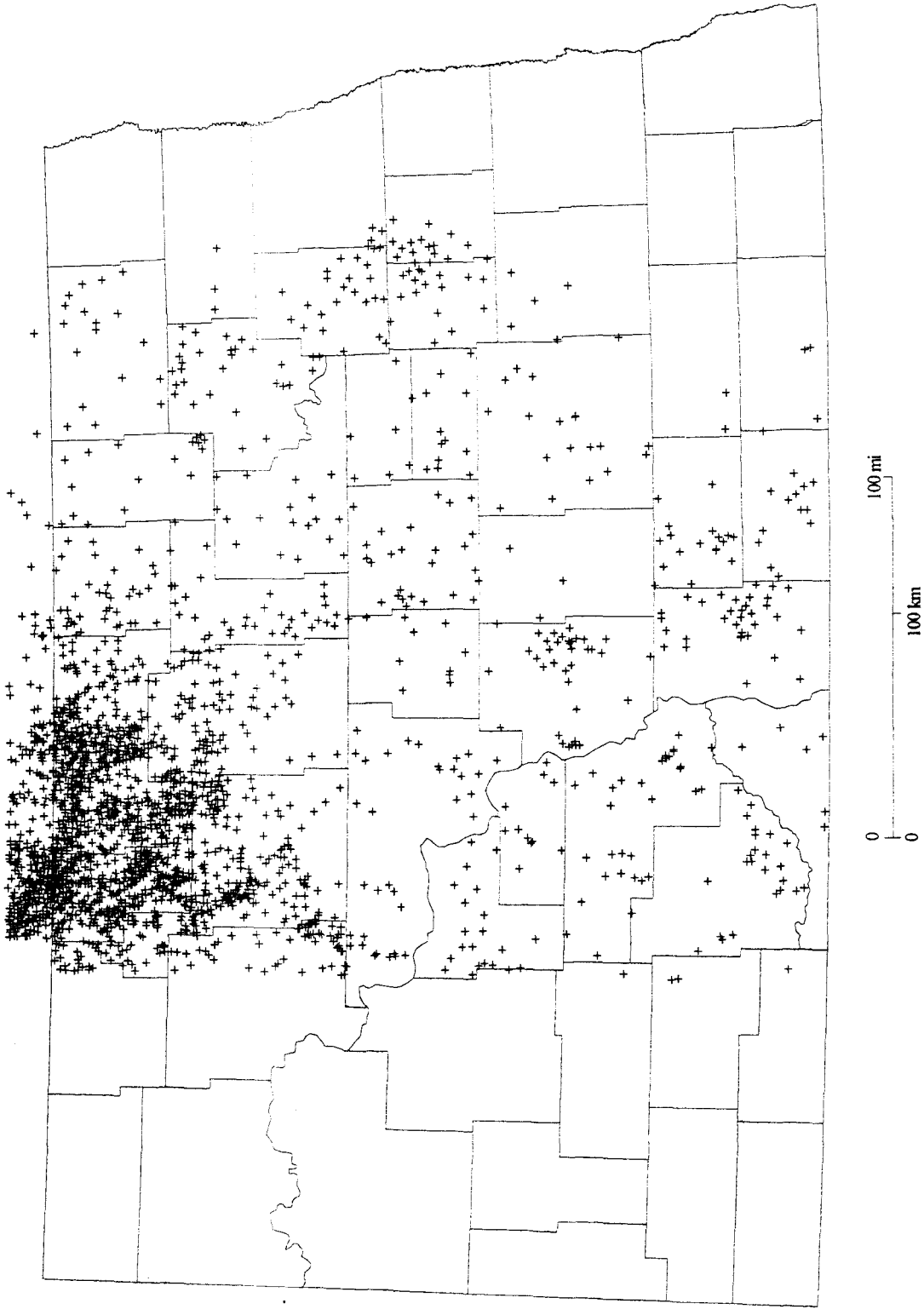

Figure 4. Map showing well control data for the Newcastle Formation.

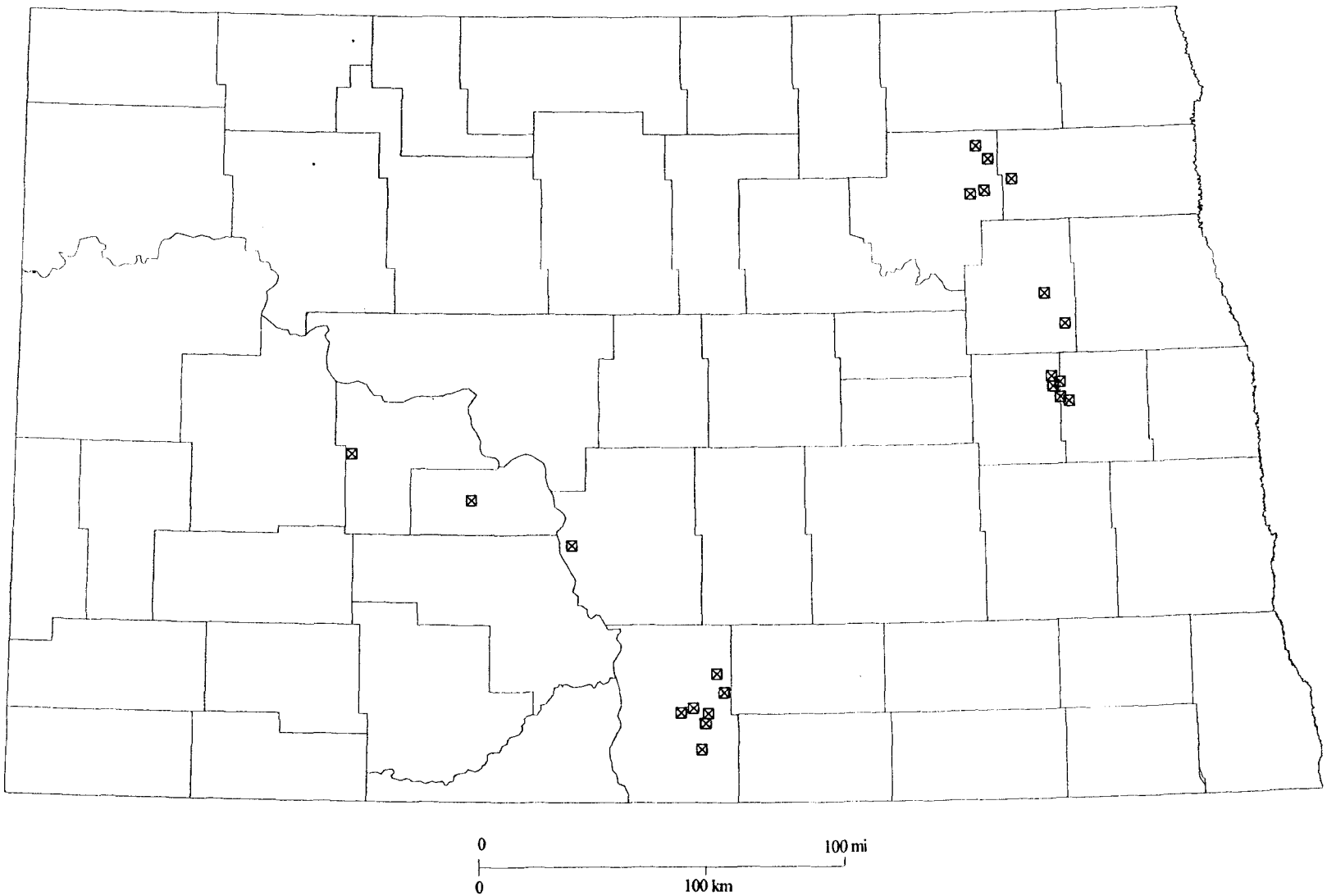

Figure 5. Map showing core locations used for study.

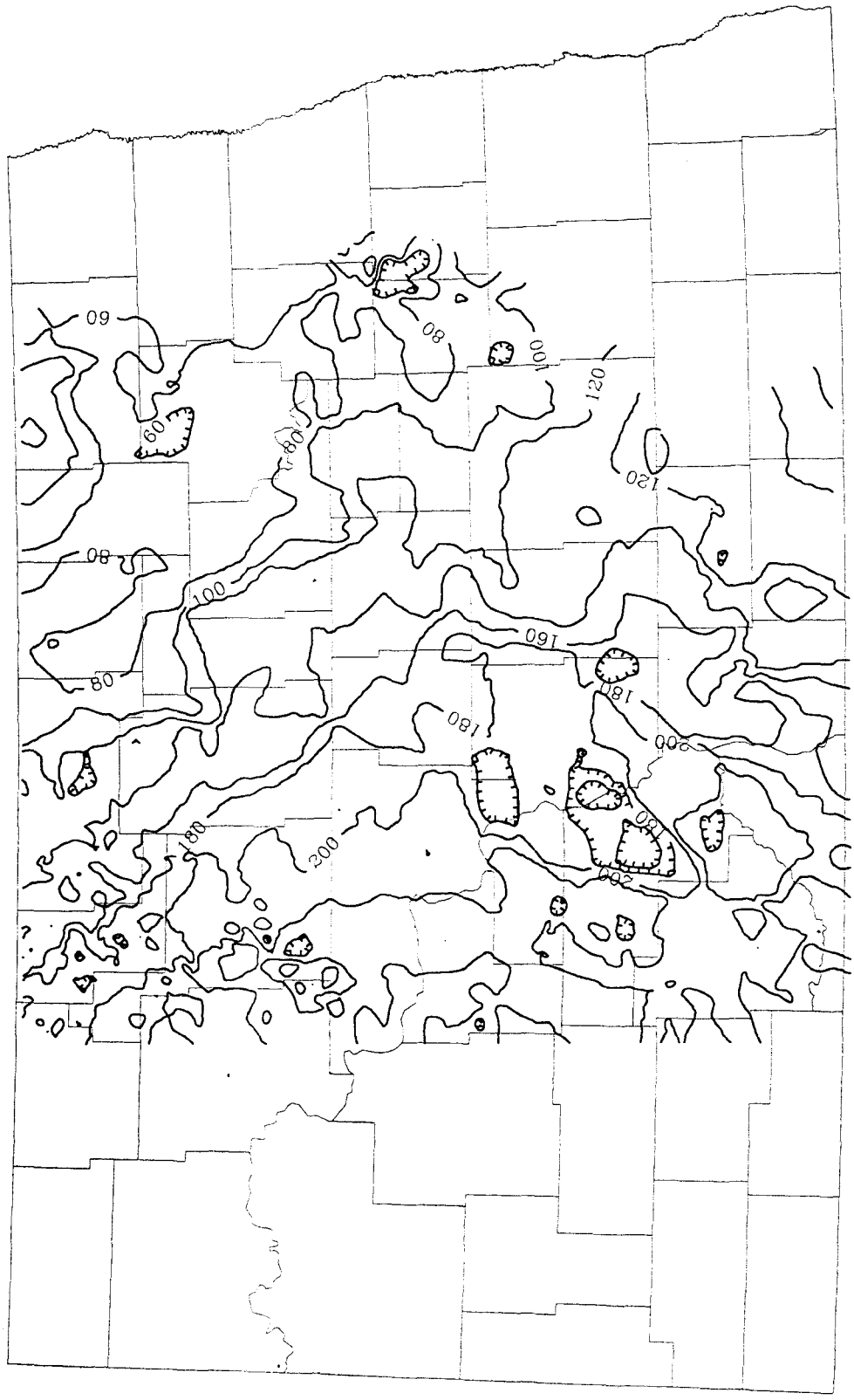

Figure 6. Isopach map of Skull Creek Shale within the study area (CI=20 ft).

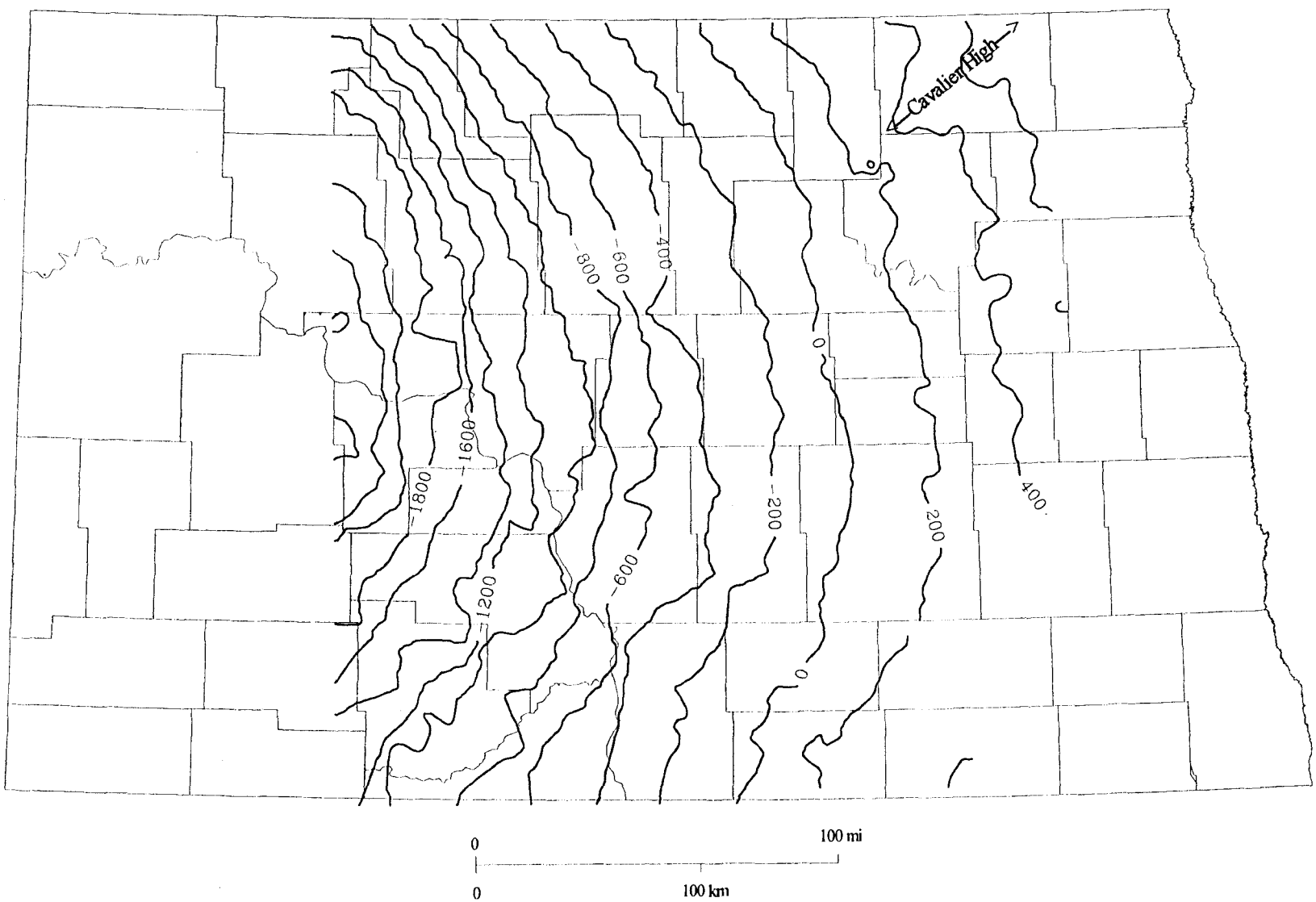

Figure 7. Structural top of Mowry Shale within the study area. Datum is mean sea level (CI=200 ft.).

Cross sections

Two east-west cross sections were constructed in order to show the thickness variations and changes in character of the Newcastle Formation. The northernmost (A-A') cross section (Fig. 8) shows the Newcastle thinning to zero in Pierce County from a uniform sand sheet about 20 feet (6m) thick in Ward County; it then reappears on the eastern side of the state in Benson County. Note how the sand pinches out gradually from the west, but abruptly reappears as thick interbedded sequences to the east; this abrupt thickening is discussed below.

The southernmost cross section (Fig. 9) shows the Newcastle thickening from a uniform, 20 foot (6m) thick sand sheet in Grant County to a highly interbedded silt and sandstone sequence in La Moure County that exceeds 180 feet (55m) in thickness. This cross section shows the transition from the uniform blocky log character in the west-central portions of the study area to the highly interbedded shoreline sequences in the southeastern part of the state.

Lithology

Analysis of the cores allowed for not only better understanding of the depositional environments, but also provided a way to match well log signatures with actual rock samples. From these matches of core with well log, lithologic changes in the unit from different parts of the state can be interpreted. The primary lithology encountered while examining the cores and core chips was mudstone. Sandstone, siltstone, and shale also are

part of the Newcastle Formation, and vary in amount and lithologic composition around the study area. Each core is described in detail in Appendix B.

The mudstone is often a light gray color, and is composed of both very fine-grained quartz sandstone and highly micaceous siltstone. It occurs in core as one to three inch thick blocks and acts as a transitional lithology between the sands and the shales. The mudstones are often highly bioturbated, and show soft sediment deformation.

The sandstones are the second most abundant lithology encountered in the study area, and are by far the most varied. Compositionally, the sandstones are made up of well-rounded quartz grains, and are often very argillaceous. This large volume of clay and silt tends to make the sands extremely muddy when wetted. There is often a large amount of mica (primarily muscovite) associated with the sandstones. Most of the sands are very fine to fine-grained, but coarse and very coarse-grained lenses are also present. Planar and trough cross-bedding, as well as small-scale ripple cross-laminations, are sometimes associated with the sandstones in the cores. Although several lenses of sandstone are very well indurated, most of the units studied are extremely friable, and fall apart with even careful handling. Most are very permeable and have good to excellent porosity.

Two basic types of sandstones occur within the study area. One is a very uniform, blanket-like sheet sandstone that appears to neither coarsen or fine upward. This type of unit is most prevalent in the west central portions of the study area.

The second type of sand unit is highly interbedded with mudstones and shales. These sands are often only a few inches to a foot in thickness and are highly bioturbated. Soft-sediment deformation is common with these interbedded sandstones; only rarely are

any other structures preserved. This type of deposit occurs along the southeastern and eastern borders of the study area. These units often have large quantities of coal chips preserved in thin lenses within the sand.

The shales and siltstones preserved in the cored units are often thin and discontinuous. The siltstones are dark gray, and are extremely high in clay content, making them very sticky when wetted. They often occur between mudstone and sandstone units. The shales are very dark gray to black, lacking in any significant silt content. Both of these units are also associated with the interbedded sands along the southern and eastern margins, but are thickest in the Emmons County area, where they separate two distinct sand lenses by some 20-30 feet (6-9m). Few structures are associated with these beds, except for occasional in-filling of burrows with sand from adjacent beds.

The general lithologic character of the Newcastle Formation changes from thin uniform sandstone deposits in the west central portions of the study area to thick interbedded sands, silts, and shales along the southern and eastern borders of the study area. The interbedded deposits form a semi-continuous ring around the eastern and southeastern boundaries of the state.

INTERPRETATIONS

The Newcastle Sandstone of eastern North Dakota can be divided into four subtypes based on depositional environments. These depositional subtypes include offshore shallow marine, nearshore marine, fluvial, and deltaic paleoenvironments. Using these four different depositional regimes, isopach maps, and previously published paleogeographic reconstructions, the depositional sequence of the unit was determined. Rough approximations of regional paleogeography were used as a basis for constructing more detailed paleogeographic maps of the region. The provenance, depositional environments, and extent of the Interior Seaway were all considered when various schematic paleogeographic maps of the region were created.

The entire depositional scenario, and what has happened since the beginning of Mowry time, is considered in the hydrocarbon potential analysis of the sandstone. Tectonic events that took place during and since Newcastle deposition also play a major role in hydrocarbon generation within the unit.

Depositional Environments

There are four distinct types of deposits that compose the Newcastle Sandstone in eastern North Dakota. Each type of deposit is associated with a distinct depositional environment. These four types include offshore marine deposits, nearshore marine

deposits, deltaic deposits, and fluvial deposits. Each has a unique log character and is associated with recognizable isopach map trends. A discussion of each deposit type follows, including its log character, location, and map trend within the study area.

The most abundant type of deposit is that which is thought to have accumulated in the shallow epeiric seaway. These deposits are typically between 20 and 40 feet (6-12m) thick, and are made up of very fine to fine-grained quartz sandstones and mudstones. They are very well sorted, well rounded, and often bioturbated. The log character of these deposits shows an occasional fining or coarsening upward, but typically a very uniform and blocky appearance (Fig.10).

These deposits occur in the west-central reaches of the study area, as depicted in Figure 11. They tend to thin to the north and east, reaching the zero edge in the central portion of the study area. In the southeastern portion of the study area, these open ocean deposits grade into the nearshore marine and deltaic deposits. They appear to be a product of a transgressive system tract, which redistributed deltaic and nearshore sands, deposited during late Skull Creek-early Newcastle time, throughout central North Dakota as a blanket or sheet sandstone.

The second most prevalent type of deposits is similar to the nearshore marine sequences described by Boggs (1987) and Friedman (1992). These deposits are typically between 40 and 100 feet (12-30m) thick, and are composed primarily of thinly interbedded, very fine-grained sandstones and mudstones. A high degree of bioturbation is commonly associated with these interbedded deposits. The log character shows this interbedding rather well, with repeated interfingering of the mudstones and sandstones

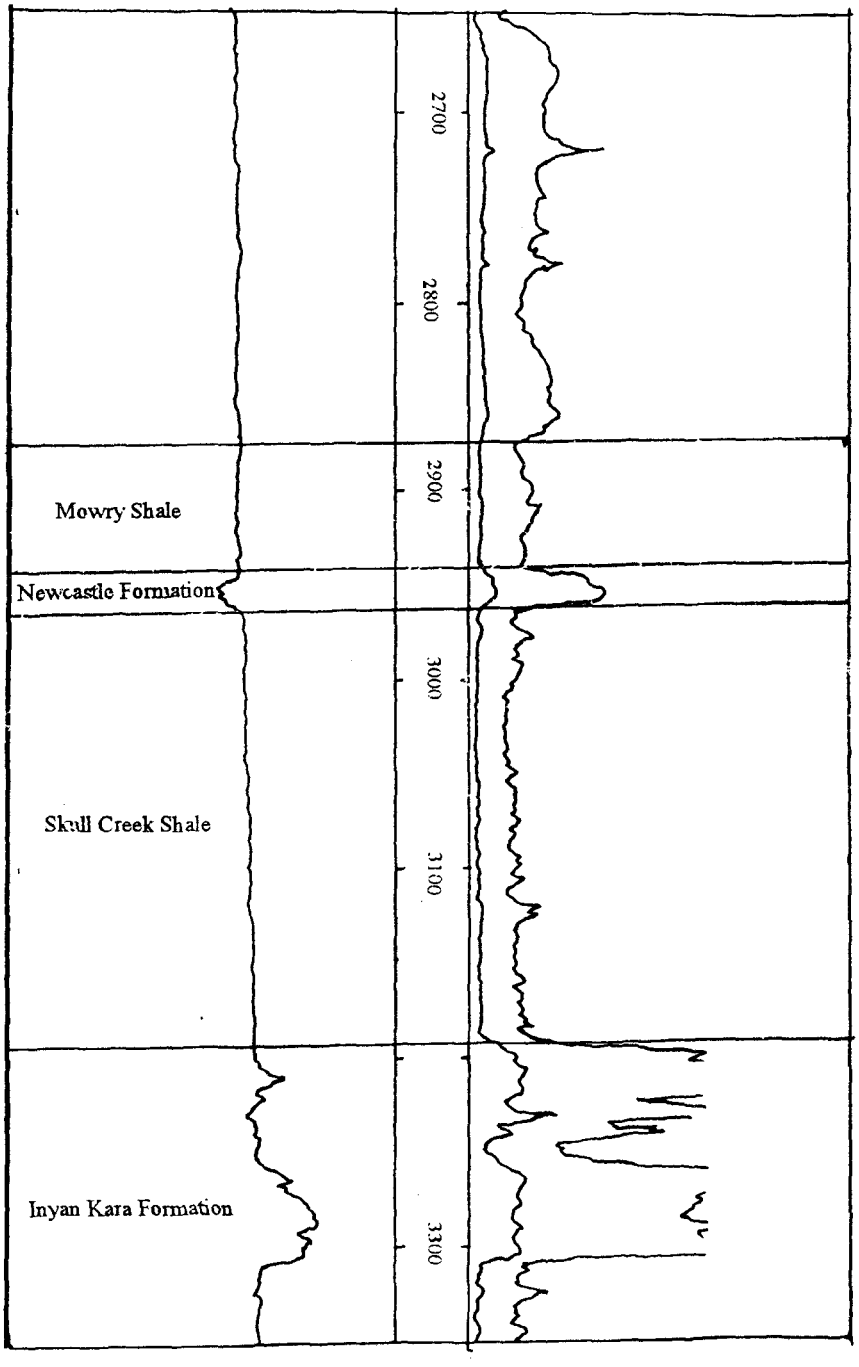

Figure 10. Well log trace showing a typical uniform, shallow off-shore marine deposit. Well #4100, 131N-85W-23 NWNW, Grant County, North Dakota.

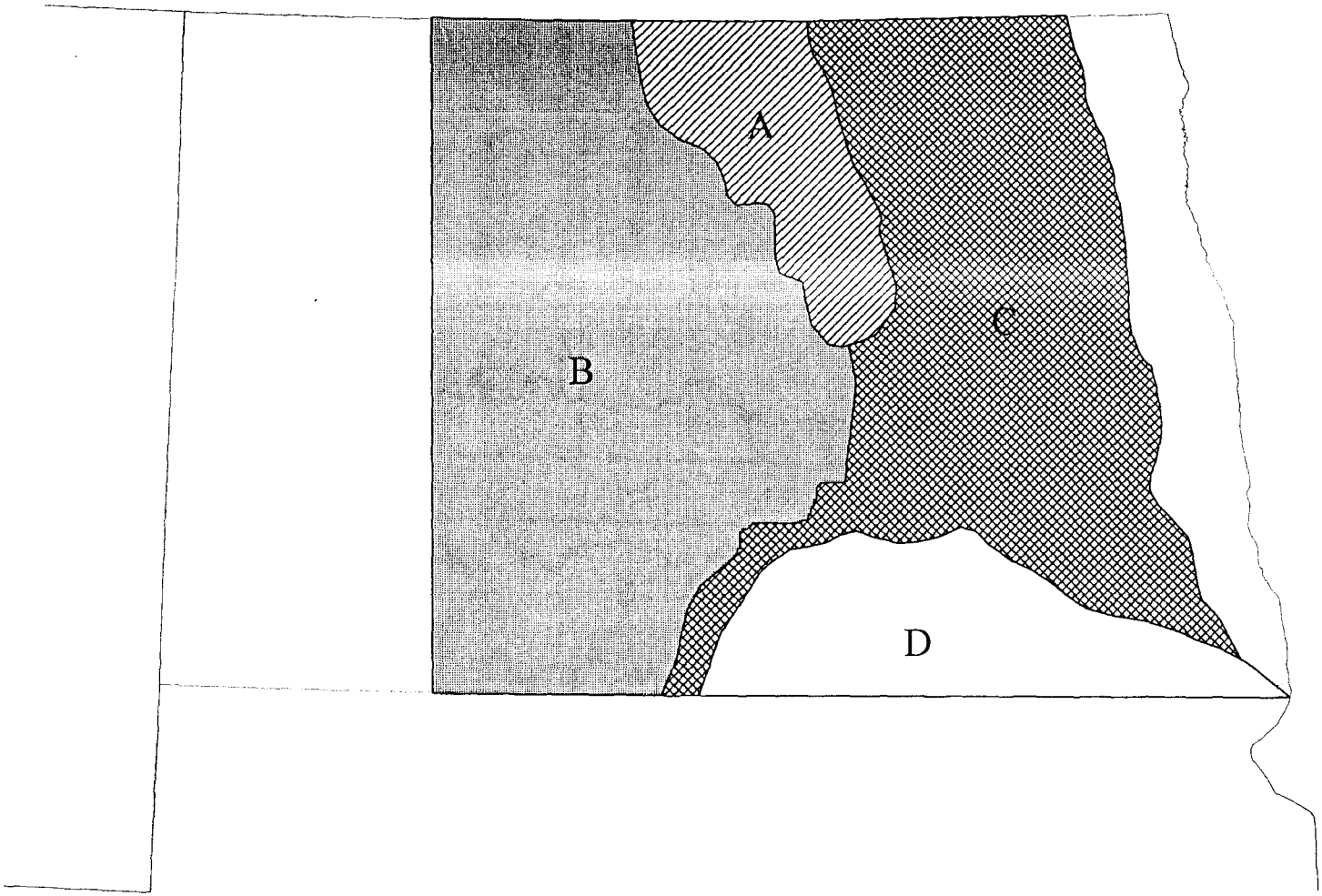

Figure 11. Schematic map showing various depositional environments of the Newcastle Formation. A: Newcastle absent, B: open ocean deposits, C: nearshore deposits, D: deltaic deposits.

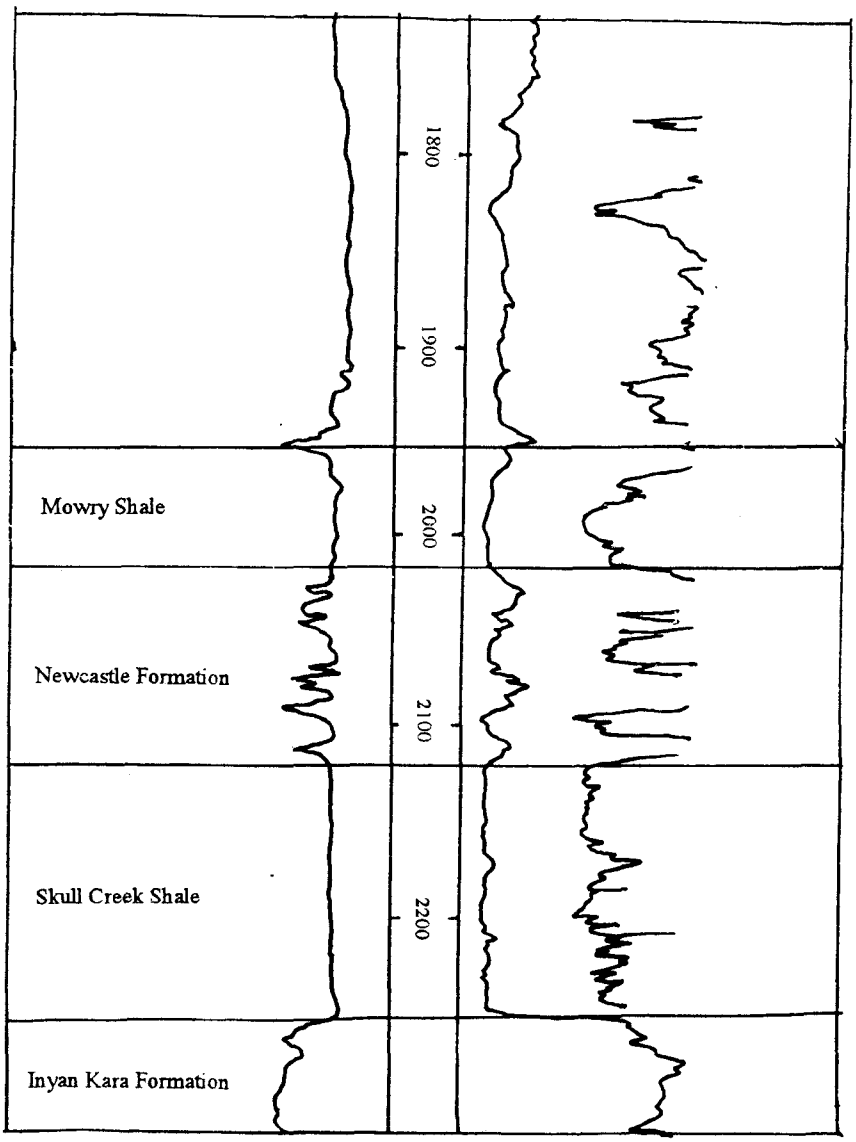

Figure 12. Well log trace showing a typical interbedded, nearshore deposit. Well #619, 130N-69W-33 SWNW, McIntosh County, North Dakota.

(Fig. 12). The interbedded package as a whole often has a coarsening-upward character to it, typical of nearshore deposits that have prograding shorelines (Boggs, 1987). This type of deposit appears to be a result of the advancing sea coming to a standstill. This allowed nearshore sedimentation to take place, and produced the interbedding within the unit.

These nearshore deposits are located along the eastern border of the study area. Well control here is notably poor, but a north-south trend is evident along the eastern reaches of the study area (Fig. 11). This nearshore trend is laterally continuous with the deltaic bodies along the southeastern margin. It is unclear whether the map pattern showing these nearshore deposits as continuous along the eastern border is correct. It would make sense that this is the case, as the position of the shoreline was probably parallel to the Minnesota-North Dakota border, based on the map pattern of these units. However, well and core control is extremely poor in this area, and the map pattern may be due in part to computer projection. The exact position of the shoreline is not known, but the well-rounded, fine-grained character of these deposits suggests that it was west of the outcrops of the Precambrian shield in Minnesota, which was probably exposed at this time (Setterholm, 1994).

This type of deposit was encountered frequently in core examination. Most of the cores analyzed were composed of interbedded sandstones and mudstones, slightly to highly bioturbated, and are located within the nearshore deposit area (Fig. 13). Thin laminations of small coal chips are also common in these deposits. Wood and plant fragments, ranging in size from 3mm to 4cm, are commonly scattered throughout these

Figure 13. Core photograph showing a typical interbedded, nearshore deposit.

Figure 14. Core photograph showing large accumulation of coal chips.

nearshore units (Fig.14). The presence of these coal fragments supports the idea of the proximity of the shoreline. This type of organic material would not be expected to survive long transport distances.

The most complicated of the deposits to analyze are those thought to be of deltaic origin. The fact that the deltaic deposits overlie the open ocean units and are laterally continuous with the nearshore units (Fig. 11) often makes separate analysis of them difficult. These types of deposits are typically more than 80 feet (24m) thick, and reach thicknesses of 220 feet (67m) in the extreme southeastern portions of the study area. They are composed primarily of interbedded very fine to fine-grained sandstones and mudstones. The log character of these deltaic units is similar to that of the nearshore deposits, distinctly showing the interfingering of the finer-grained mudstones with the coarser-grained sandstones (Fig. 15).

The primary difference between the deltaic and nearshore deposits is that the deltaic units tend to show a much blockier log signature, often coarsening upward within each blocky sub-interval. The blocky, interbedded units also are occasionally separated by several meters of dark black shale (Fig. 16). The coal-chip content of these deltaic units is much higher than in the open ocean deposits and slightly higher than in the nearshore deposits. The size of the coal chips are larger than in the nearshore and open ocean deposits.

The blocky log character of the deltaic units may be due to one or more factors. One cause for the blocky character may be related to repeating cycles of deltaic lobe abandonment. As an active distributary emptied into the deeper water, fluctuations in the

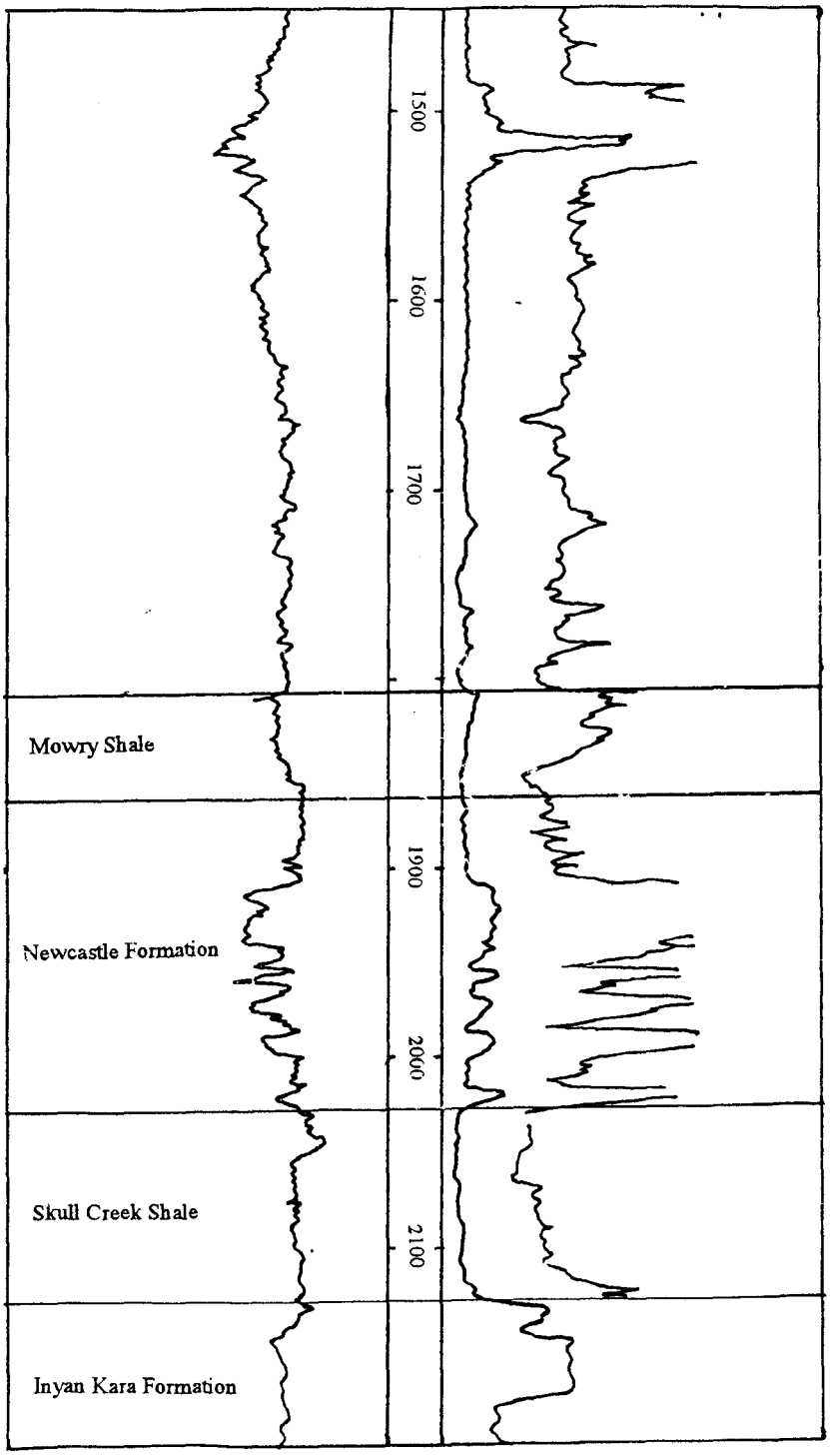

Figure 15. Well log trace showing a typical blocky, interbedded, deltaic deposit. Well # 4629, 130N-74W-3 SESE, Emmons County, North Dakota.

Figure 16. Core photograph showing intraformational shale break.

amount of sand and mud delivered to the system would result in small-scale interbedding within a given lobe (shown on the log as a blocky signature). As the individual distributary was abandoned, a similar situation would begin to occur elsewhere within the delta. Rejuvenation of the distributary at a later time would produce a vertical stacking of these interbedded deposits, which would coarsen upward.

A second explanation of the blocky interbedded log character may be variability in stream load and discharge. During periods of high volume sand discharge, thicker, sand-rich deposits would dominate the deltaic system. These sand-dominated pulses would produce the blocky log signature. Small interbeds of shale and siltstone may reflect minor fluctuations of the sediment load. This would perhaps explain the interbedded log character as well. Shale breaks between the individual blocks may represent periods of relatively minor stream discharge, such as during a drought.

The occurrence of 10-20 feet (3-6m) of shale associated with several cores and many of the logs in Emmons County may be due to one of several factors. The shale break may have been the product of localized subsidence of the deltaic deposits, or perhaps it was created by long-term deltaic lobe abandonment. A third possibility may be a localized, small-scale transgression, which may have provided deep, quiet water for fine-grained sedimentation to take place. If the latter hypothesis is correct, one would expect to find regional evidence of this transgression. More well control and especially more core control are needed before any further conclusions can be made. It appears, from the

present core and well control, that this shale break is localized, and does not extend beyond the Emmons County area.

The final type of deposit recognized in the study area appears to be fluvial in origin. The log character of these deposits shows a fining-upward sequence, approximately 15-30 feet (5-9m) thick (Fig. 17). The units are composed of clay-rich, fine to medium-grained quartz sandstone. Significant amounts of large coal chips are associated with these deposits. Very little bioturbation occurs in the fluvial deposits. The fining-upward character, high organic content, and low degree of bioturbation all support the conclusion that these are indeed fluvial deposits (Boggs, 1987). These deposits occur near the margins of the study area, and are associated with deltaic deposits. The fluvial deposits occur as a cap above the interbedded deposits of the deltas, perhaps as a result of progradation of the strand line.

These fluvial deposits probably represent progradation of the shoreline during maximum periods of erosion and deposition. The close association with the deltaic deposits is interpreted to be a result of fluvial migration seaward, advancing over the previously deposited deltaic units. These were perhaps part of a very broad, gently sloping alluvial plain complex.

Depositional History

To understand the Newcastle Sandstone completely, the overall depositional history must be considered. The various depositional environments previously discussed all are inherently related to the depositional history. The main event that controlled the

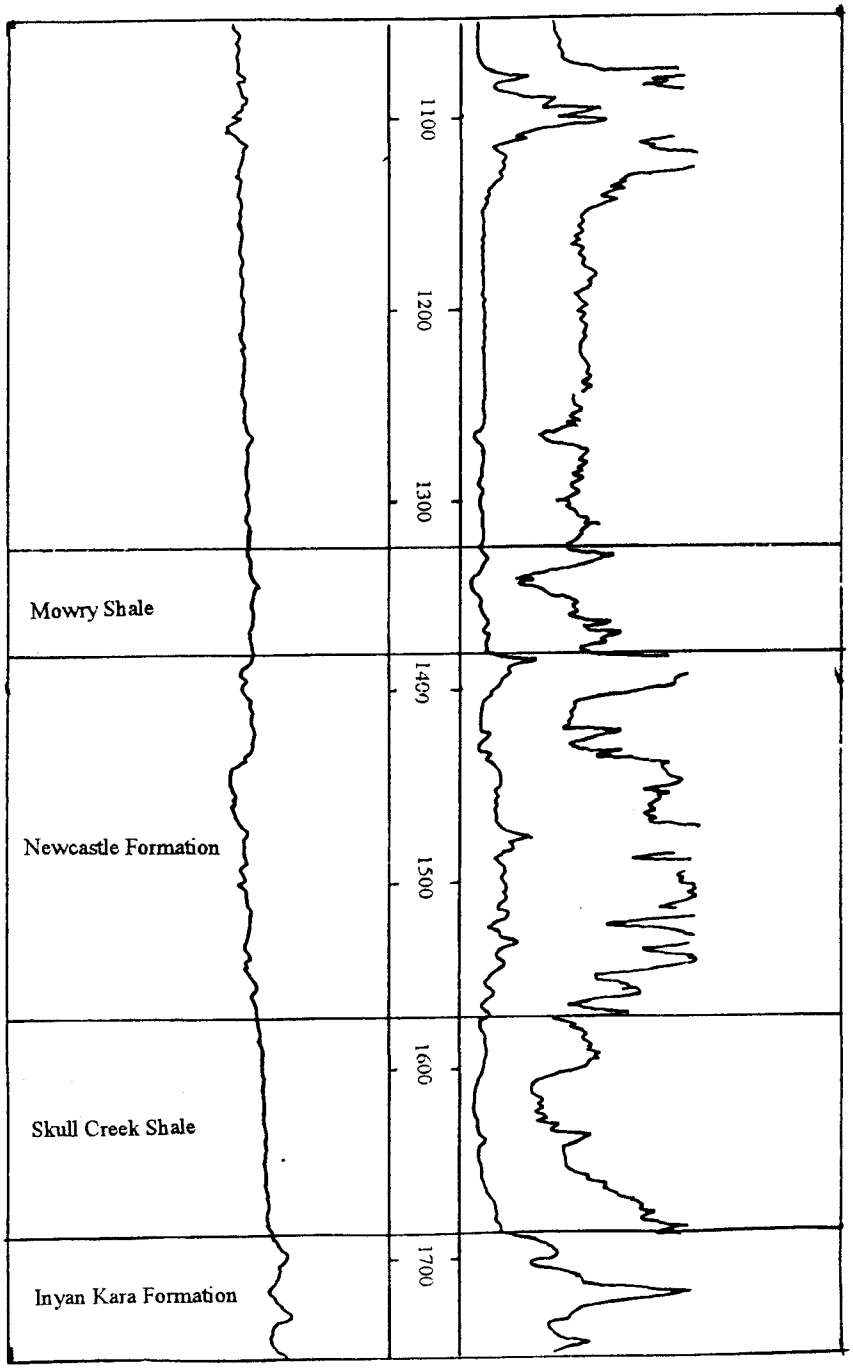

Figure 17. Well log trace showing a typical fluvial deposit. Well # 3997, 133N-64W-18 NWNW, LaMoure County, North Dakota.

Newcastle deposition was the regression and subsequent transgression of the Cretaceous Interior Seaway. Each deposit type is related to different stages of this regressive-transgressive event.

Prior to Newcastle deposition, the study area was completely inundated by the Western Interior Seaway, referred to from here on as the Skull Creek Sea (Williams and Stelck, 1975). Exact water depths have not been determined, but the notable lack of coarser-grained clastics within most of the Skull Creek Shale suggests that the water in the region was at least deeper than wave base and far enough away from the shoreline to be unaffected by any fluvial influx of sediments. The easternmost deposits of the Skull Creek Shale do contain silt and sand lenses near the top of the unit. These perhaps represent offshore bar deposits, or possibly even shoreline sediments. If the latter hypothesis is valid, better well control should show a continuous pattern of these sand and silt deposits within the Skull Creek Shale. Therefore, the shoreline during Skull Creek time would have been present parallel to the Minnesota-North Dakota border in eastern North Dakota, but beyond the limit of well control (Fig. 18). If these are truly offshore bar deposits, increased well control should show somewhat discontinuous sand and silt bodies that parallel the paleoshoreline, surrounded by shale. The shoreline however, would have been farther away, perhaps in western Minnesota.

The sea began to retreat to the north and west as Skull Creek deposition came to an end (Williams and Stelck, 1975, Witzke et al., 1983, Setterholm, 1994). As the sea retreated, it exposed the shales recently deposited to erosion. The exact amount of time it took for the sea to retreat is unknown, but it can be roughly estimated. Harland et al.

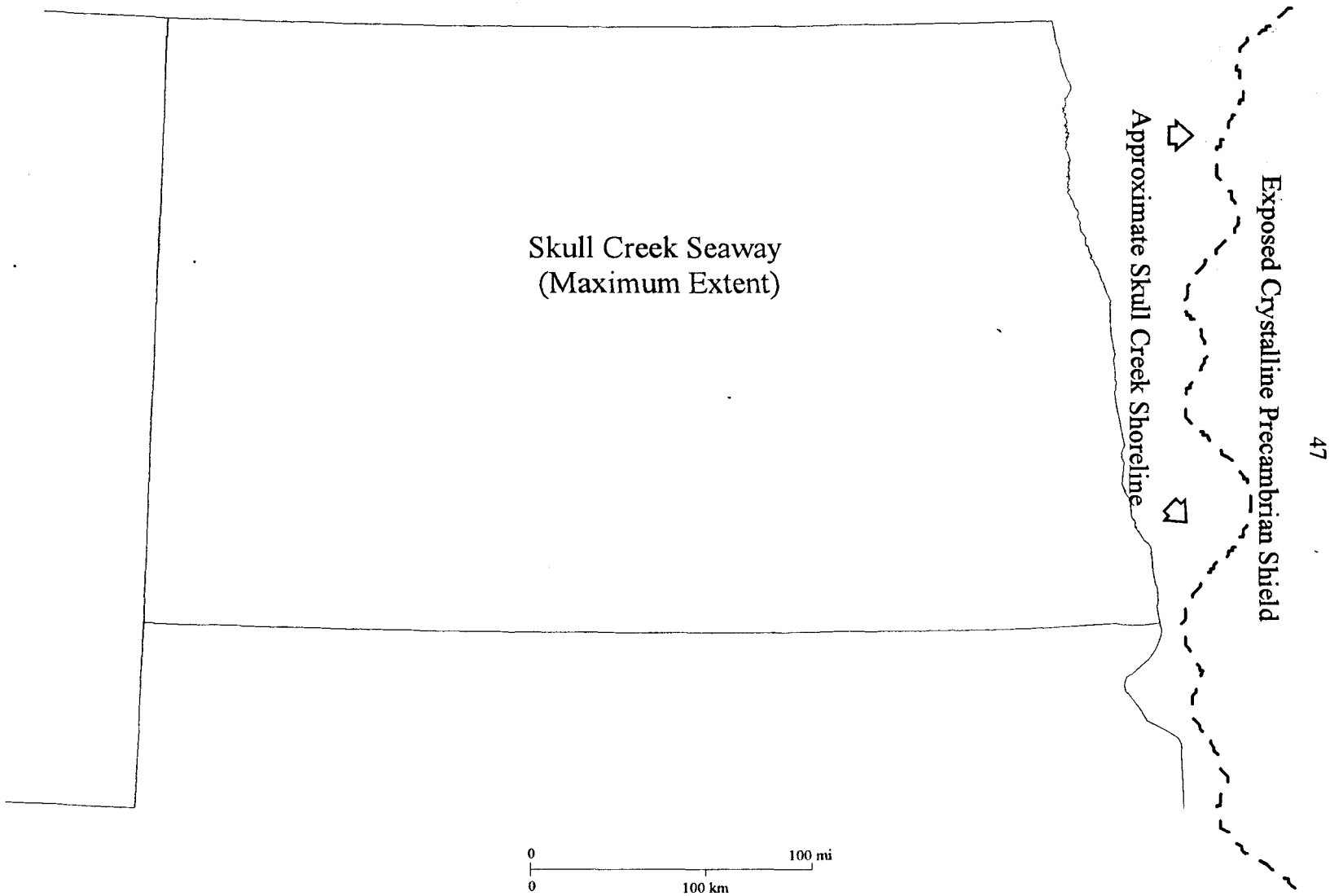

Figure 18. Schematic diagram showing possible highstand position of Skull Creek shoreline.

(1990) estimated the absolute age of the Albian as 112-97 Ma. If the estimations by Vuke (1983) and Weimer (1992) are correct, the age of the base of the Skull Creek Shale is early to middle Albian (99 Ma) and the top of the Mowry is at the Albian-Cenomanian boundary (96 Ma). Weimer (1984) also estimated that 2 million years had passed from the onset of Skull Creek deposition to the end of Mowry deposition, and that the maximum lowstand regression took place at about 97 Ma. Therefore, the total time taken for the Skull Creek Sea to retreat is probably on the order of 1 million years.

One reason that this age is difficult to determine from the rock record is that the amount of erosion on the Skull Creek-Newcastle unconformity is hard to detect. The difficulty is due to the fact that shale is not easily eroded by running water, unless the stream gradient is quite high, or there is sufficient sand in the system to erode the units.

The amount of erosion that took place in the study area was probably minimal. Two factors controlled the erosion rates of the shale. The overall slope of the region was very slight, dipping to the west-northwest (Williams and Stelck, 1975, Rice et al., 1983, Witzke et al., 1983, Dyman et al., 1994, Setterholm, 1994). Therefore the streams that developed on the Skull Creek deposits were probably low-gradient, meandering rivers. Another factor that may explain the lack of erosion in the study area is the lack of sand in the system. Without sand transported by moving water, even a rather large river would probably not have eroded significant amounts of shale from the exposed Skull Creek. There is little evidence that suggests that sand was ever in the erosional system. There was apparently no significant source of sand in the immediate region at the end of Skull

Creek time. Without this sand source, erosion rates of the Skull Creek Shale would have been reduced significantly.

Where sand could be eroded, and entrained in the fluvial system, significant amounts of erosion took place. Work done by LeFever and McCloskey (1995) on the Newcastle Formation of the Williston Basin shows significant incision of stream channels into Skull Creek shales (Fig. 19). Incised channels with depths exceeding 100 feet (30m) are present in northwestern South Dakota, southwestern North Dakota, and eastern Montana. These streams are believed to have begun incision during the retreat of the Skull Creek Sea, and continued to incise actively until the re-advancement of the sea. The source of the sand in this stream system is thought to be a result of unroofing of the Dakota Sandstones of Early Cretaceous age to the southeast (Bolyard, 1969).

Detailed analysis of the Skull Creek isopach map, as previously mentioned, shows several localized thin trends. These trends are perhaps subtle drainage developments within the Skull Creek Shale (Fig. 20). If there was little sand in the system at this time, one would not expect large stream channels to be developed, as discussed earlier.

Following the retreat of the sea, during the maximum lowstand phase (97 Ma), sand and silt delivered to the sea by streams began to build deltaic deposits that prograded into the open seaway (Fig. 21) then present in central Montana (Dolson et al., 1991). As the sea began to rise, it transgressed over these deltaic and channel sands and silts. During the retreat of the shoreline, these previously deposited, locally thick sands were reworked and redistributed as a thin, blanket sand sheet across much of North Dakota.

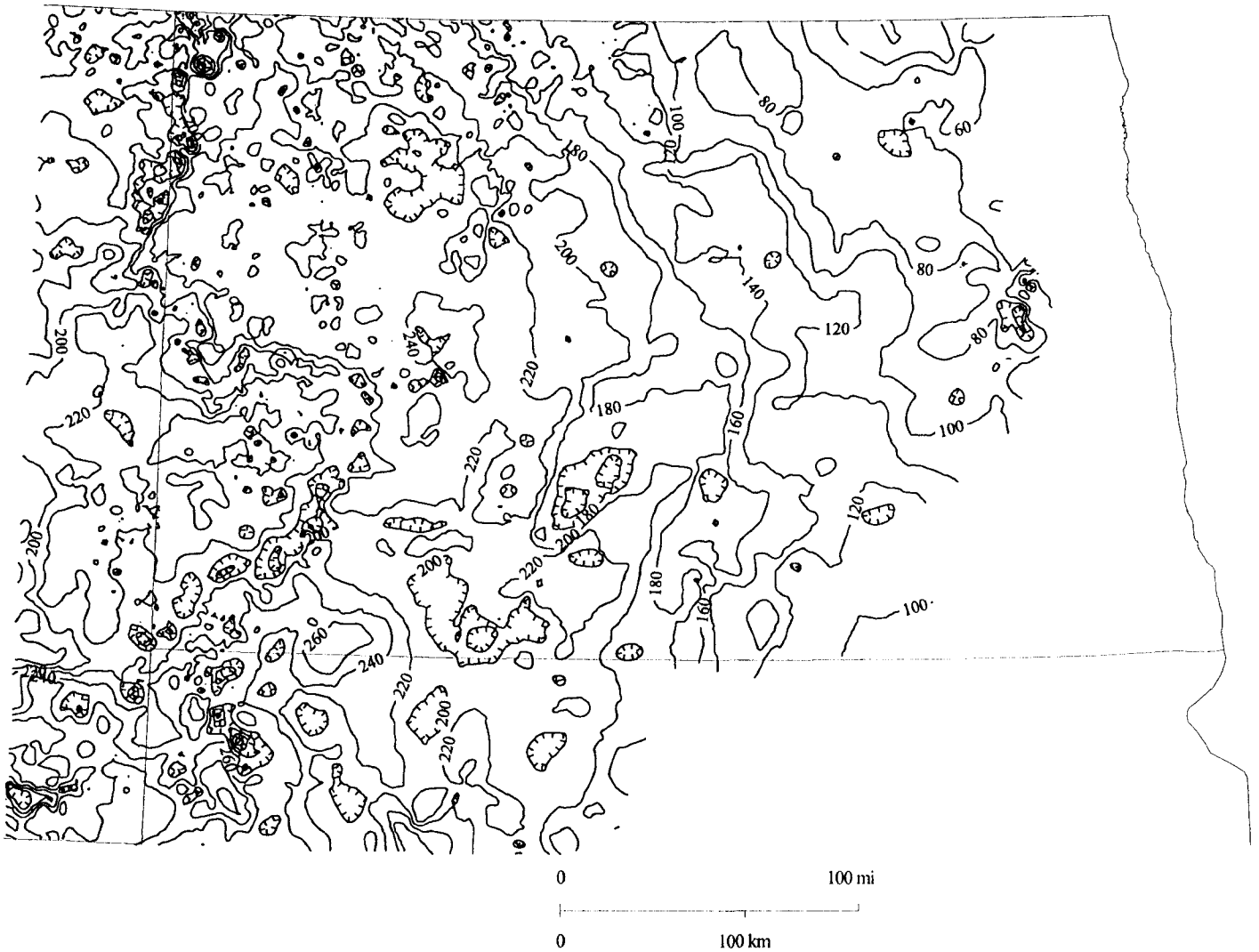

Figure 19. Regional isopach map of Skull Creek Shale (taken from LeFever and McCloskey, 1995).

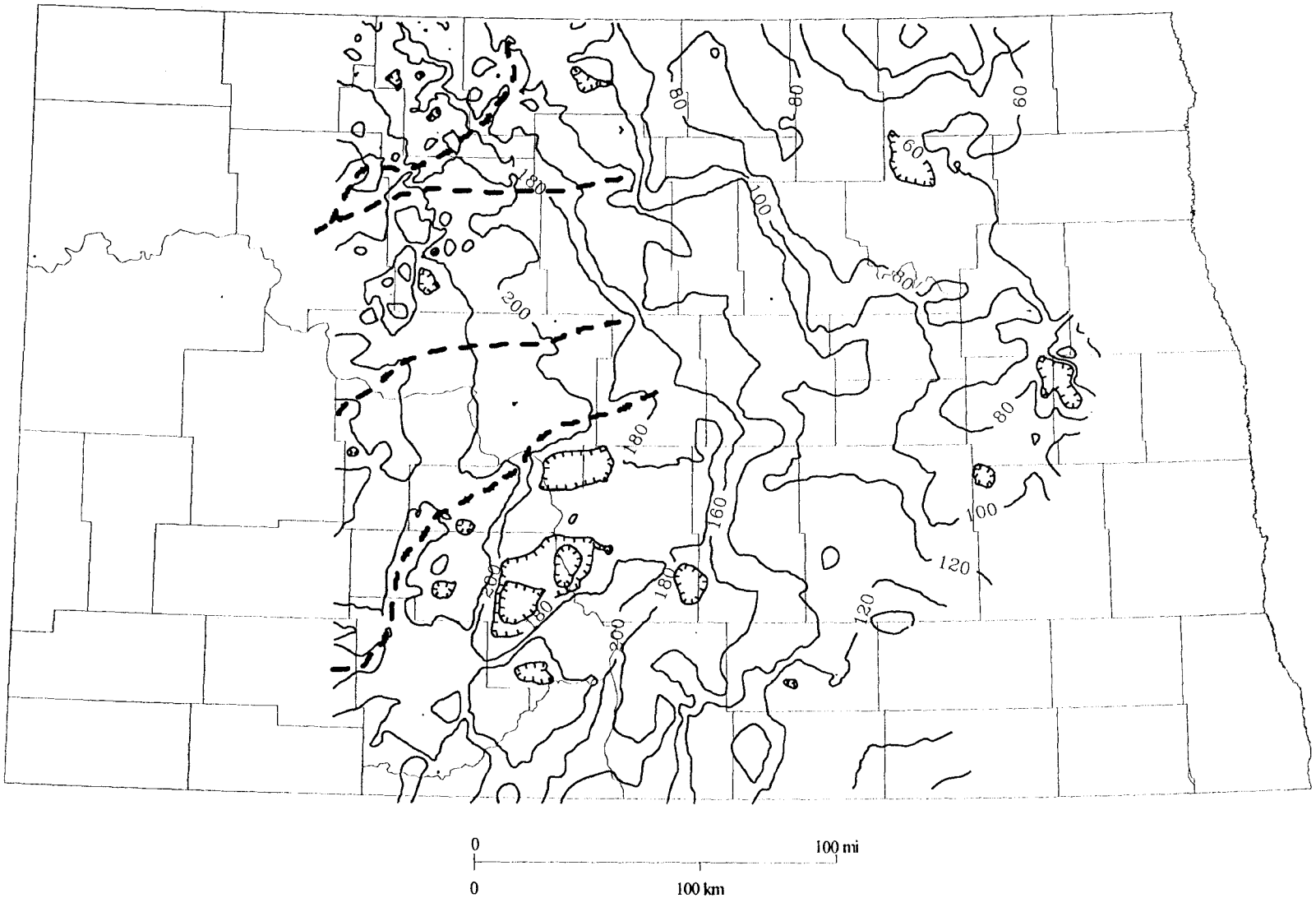

Figure 20. Isopach map of Skull Creek Shale within the study area. Dashed lines show possible incised tributaries (CI=20 ft).

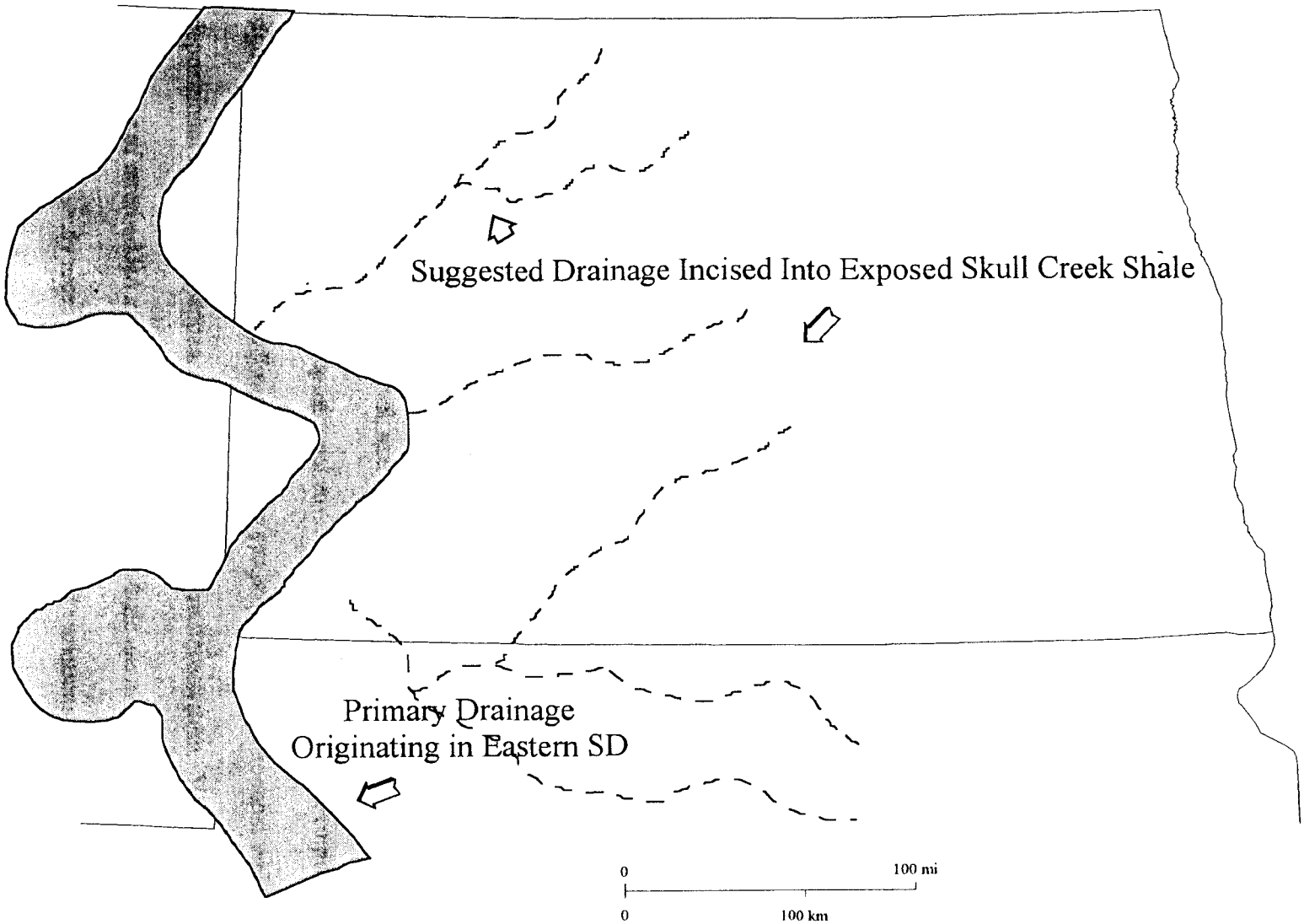

Figure 21. Schematic diagram showing fluvial system development during Skull Creek-Newcastle lowstand.

These redistributed blanket sands are those deposits that occur in the west-central portions of the study area, yielding the uniform log signature. The sea advanced in a relatively uniform manner to the east-southeast, redistributing the channel sands as it progressed. The uniform rate and direction of advancement is indicated by the relatively consistent thickness of the Newcastle in the west-central part of the study area, and by the lack of any interbedded mudstones or shales within this type of deposit.

As the sea reached the extreme eastern portions of the study area, the amount of sand in the system diminished. As a result, there were large areas with little or no sand deposition. The large area of zero Newcastle thickness shown in Figure 2 is probably where no reworked sediments were deposited. The northwest-southeast trend of this area may represent the direction of advancing sediments being redistributed from the west, perhaps controlled somewhat by ocean currents. No Newcastle sediments of this age were deposited in areas east and perhaps south of this zero area. The isopach map shows Newcastle deposits to the northeast, east, and south of the zero area, but those thicker sands are thought to have been deposited at a later time.

Once the Newcastle Sea had advanced into the easternmost reaches of the study area, it reached a new highstand level, and remained relatively stationary for some time (Fig. 22). As a result, several depositional environments had enough time to produce significant accumulations of sediment along the eastern shoreline. The most widespread depositional environment appears to have been the nearshore system. Vertical stacked sequences of interbedded sandstones, siltstones and shale are common along the eastern boundary of the study area. These formed as localized variations in sea level produced

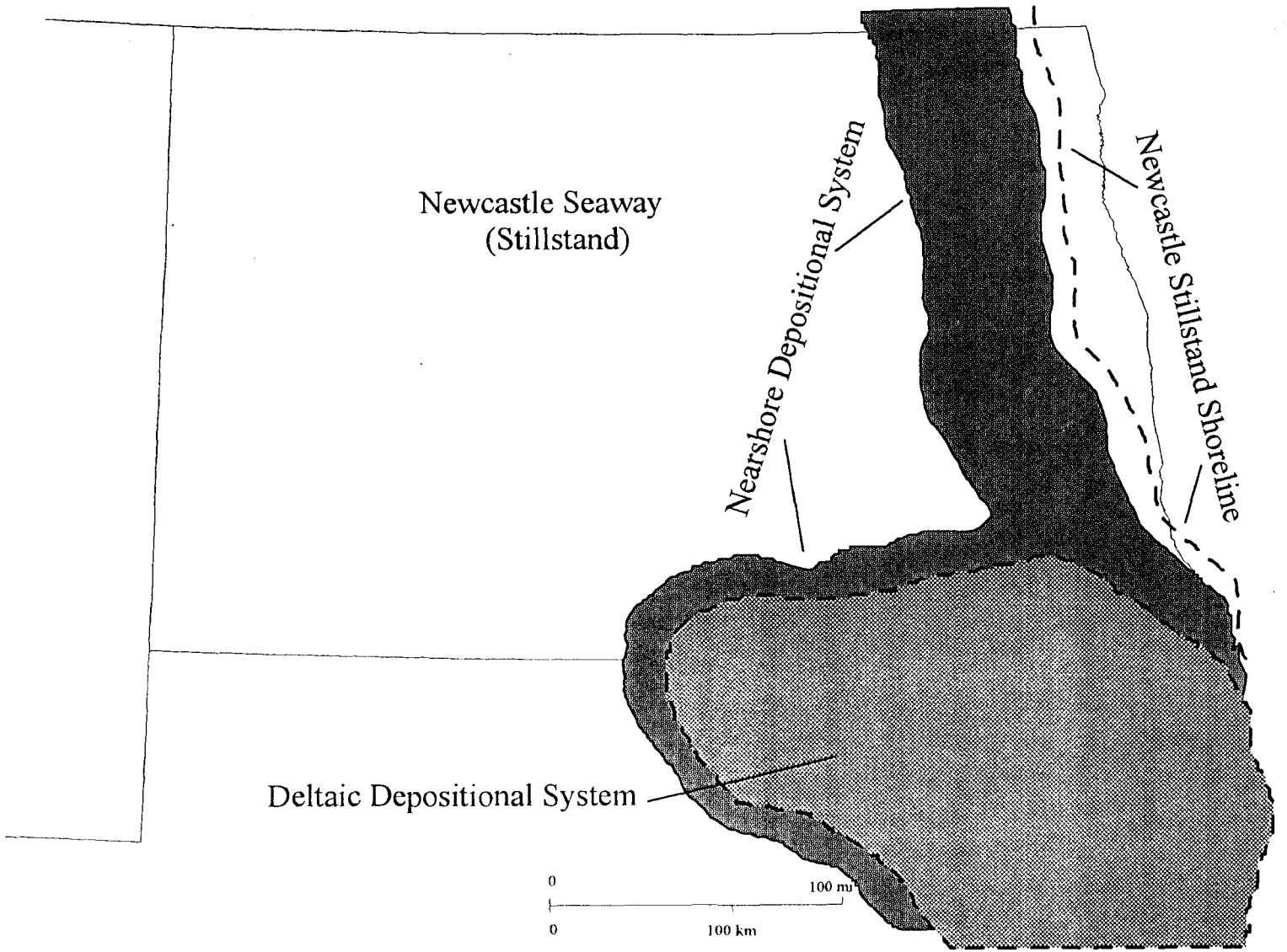

Figure 22. Schematic diagram showing estimated position of Newcastle stillstand shoreline and its associated environments.

deeper, quiet water environments that led to shale and siltstone deposition. As the sea level fell, the coarser clastics of offshore bars and beach deposits became interbedded with the shales. This alternating sequence produced the relatively thick Newcastle deposits along the eastern border of the study area, and perhaps continued around the leading edge of the deltaic system to the south.

In the extreme southeastern portions of the study area, deltaic sediments were simultaneously being deposited along with these nearshore sequences (Fig. 22). The extremely thick sequences of interbedded sandstones and mudstones were probably deposited at the same time as nearshore deposition was taking place to the north and east. Deltas developed as a result of the influx of coarser-grained clastics, which were derived from rocks unroofed to the south and east (Reishus, 1967; Bolyard, 1969). These deltaic sequences are, by far, the thickest of any Newcastle deposits in the study area. Near the outer reaches of the deltas, nearshore processes perhaps also helped to control the deposition of the fine-grained deposits.

At the end of Newcastle deposition, the sea again began to rise and advance to the east. The water became deeper, and the influx of coarse-grained clastic sediments was probably drastically reduced, as the sea again transgressed to the south and east. Offshore bars were deposited at the base of the overlying Mowry Shale, along the eastern edge of the study area. These bars probably represent the last trace of coarse-grained sedimentation that took place during Mowry time (Fig. 23). The new Mowry highstand probably occurred at about 96.5-96 Ma.

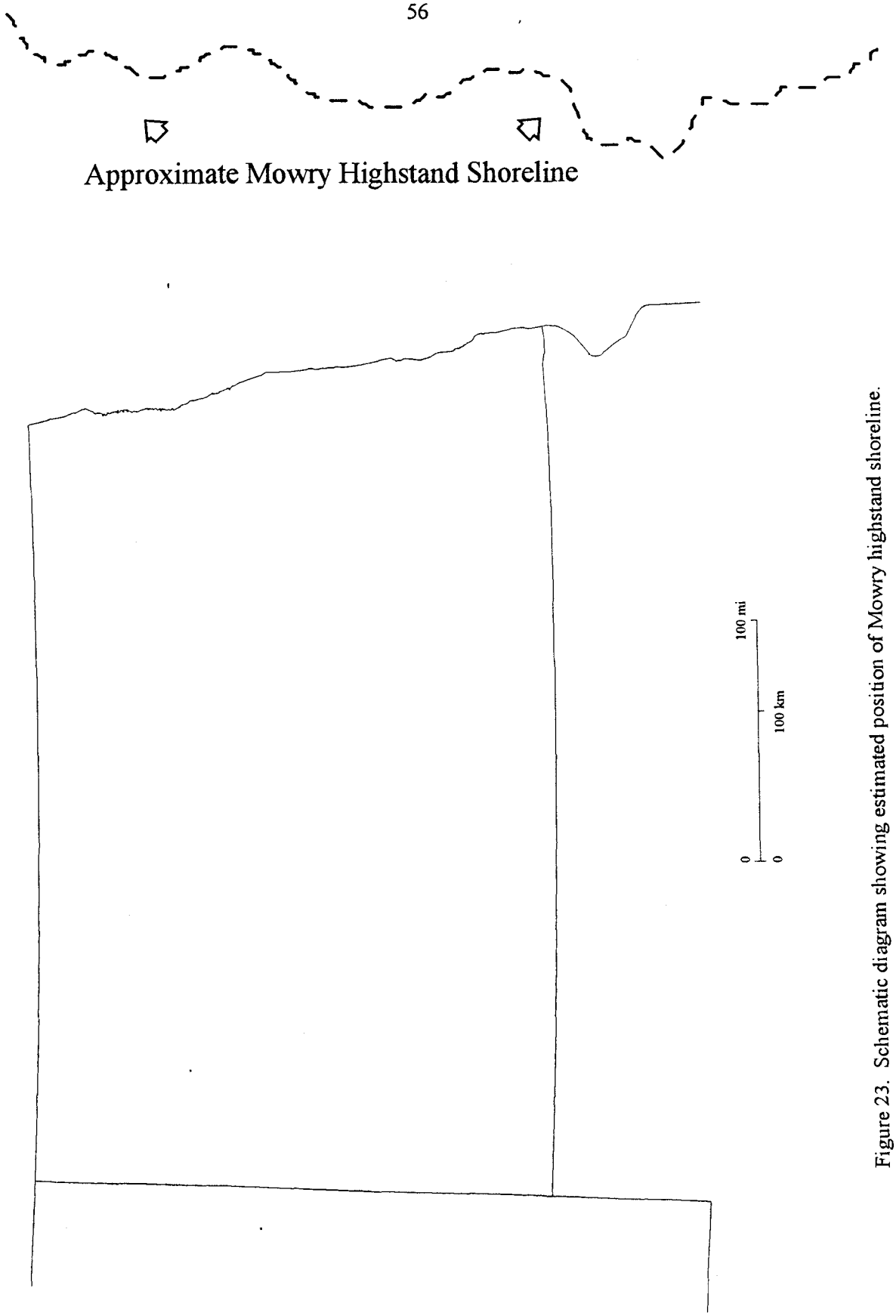

Figure 23. Schematic diagram showing estimated position of Mowry highstand shoreline.

Provenance

There has been little work done on the provenance of the Newcastle Formation in North Dakota. Several sources are suggested here, based mainly on thin section analyses and core descriptions. There may actually have been more than one source providing sediments to the sea during this time. One may have been the lowermost Cretaceous Dakota Formation that was being unroofed to the southeast during Newcastle deposition (Bolyard 1969) (Fig. 24). A second source may have been the crystalline Precambrian Shield rocks that were probably exposed during the Early Cretaceous to the north and east in Minnesota.

Sand and silt derived from the Dakota Formation in eastern South Dakota may have been the only source of coarse-grained clastics needed to help post-Skull Creek rivers incise into the exposed shales. LeFever and McCloskey (1995) (Fig. 25) show thick Newcastle deposits extending into the central portions of South Dakota. These thick sandstones probably represent the main drainage extending into this region. Sand eroded from the Dakota Formation would have been washed into minor tributaries, and eventually connected with the primary channel system shown in Figure 21. The rounded to sub-rounded texture of these sands, observed in cores and thin sections, suggests that these are second cycle sediments, which is consistent with a source in the underlying Dakota Formation sands.

The second source that may have provided clastic sediments to the Newcastle depositional system was the Precambrian Shield, which was probably exposed in north central Minnesota during the Early Cretaceous (Witzke et al., 1983, Setterholm, 1994).

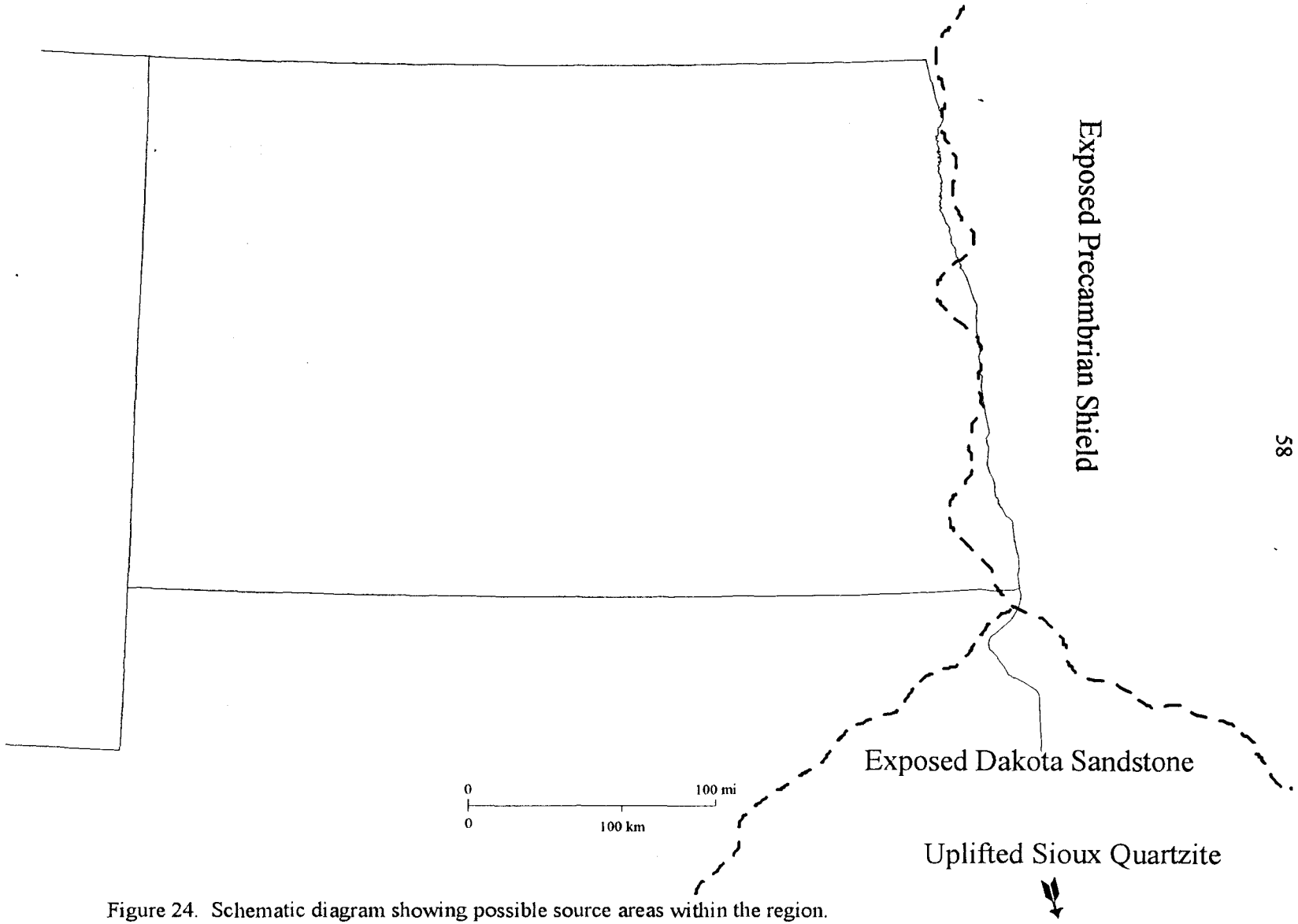

Figure 24. Schematic diagram showing possible source areas within the region.

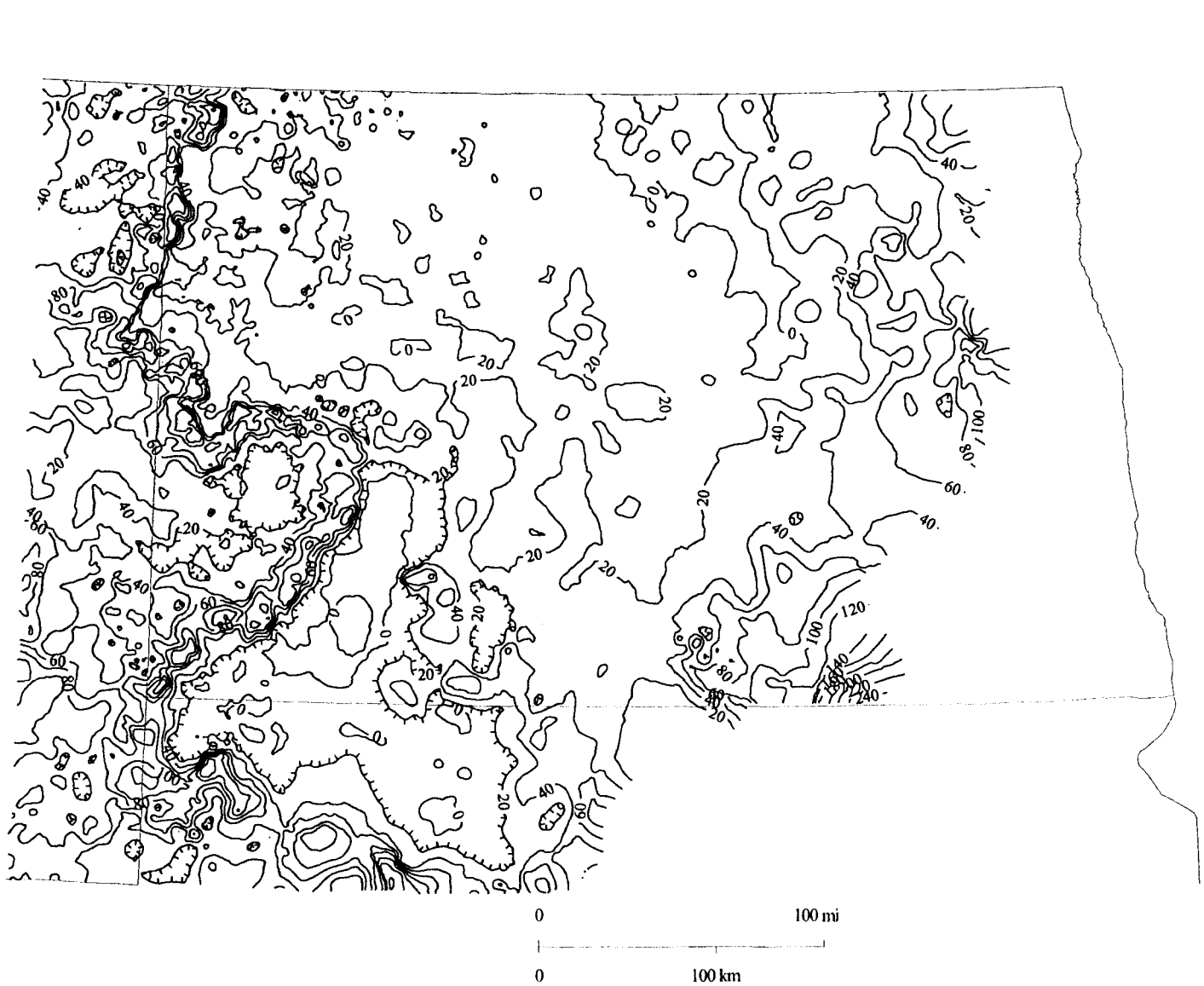

Figure 25. Regional isopach map of Newcastle Formation (taken from LeFever and McCloskey, 1995).

Sediments derived from the shield were probably not very immature. The climate of this region during the Cretaceous was probably humid and subtropical (Williams and Stelck, 1975, Witzke et al., 1983, Leckie and Reinson, 1993, Setterholm, 1994). The unstable ferromagnesian minerals and feldspars of the exposed crystalline rocks would probably weather extremely fast, and produce a thick soil profile. Any remaining minerals, such as quartz and micas, could easily be washed into the draining streams, along with abundant amounts of clay and silt. The Newcastle Formation sands are very muddy and clay-rich, as well as high in mica content, particularly muscovite. This is consistent with the idea that at least some of the sediments deposited in the Newcastle Sea may have been derived from the shield.

It would be somewhat difficult to distinguish between the clastic sediments derived from the Precambrian crystalline rocks and from the Lower Cretaceous Dakota Sandstone. Both types of sediment would be expected to contain large amounts of well-rounded quartz, as well as significant accumulations of clays and silts.

A third possible source for the Newcastle sediments is the Sioux Quartzite of southeastern South Dakota. This feature has been shown to be a topographic high during the Early Cretaceous (Witzke et al., 1983, Dyman et al., 1994). Second cycle sands could have been eroded from this feature and transported to the north, eventually mixing with the Dakota sediments. The Sioux Quartzite (or Sioux Ridge) is part of the Transcontinental Arch that stretches northeast-southwest through Minnesota and Iowa (Fig. 26). The arch itself may have also been active during this time, and added additional clastic sediments to the system.

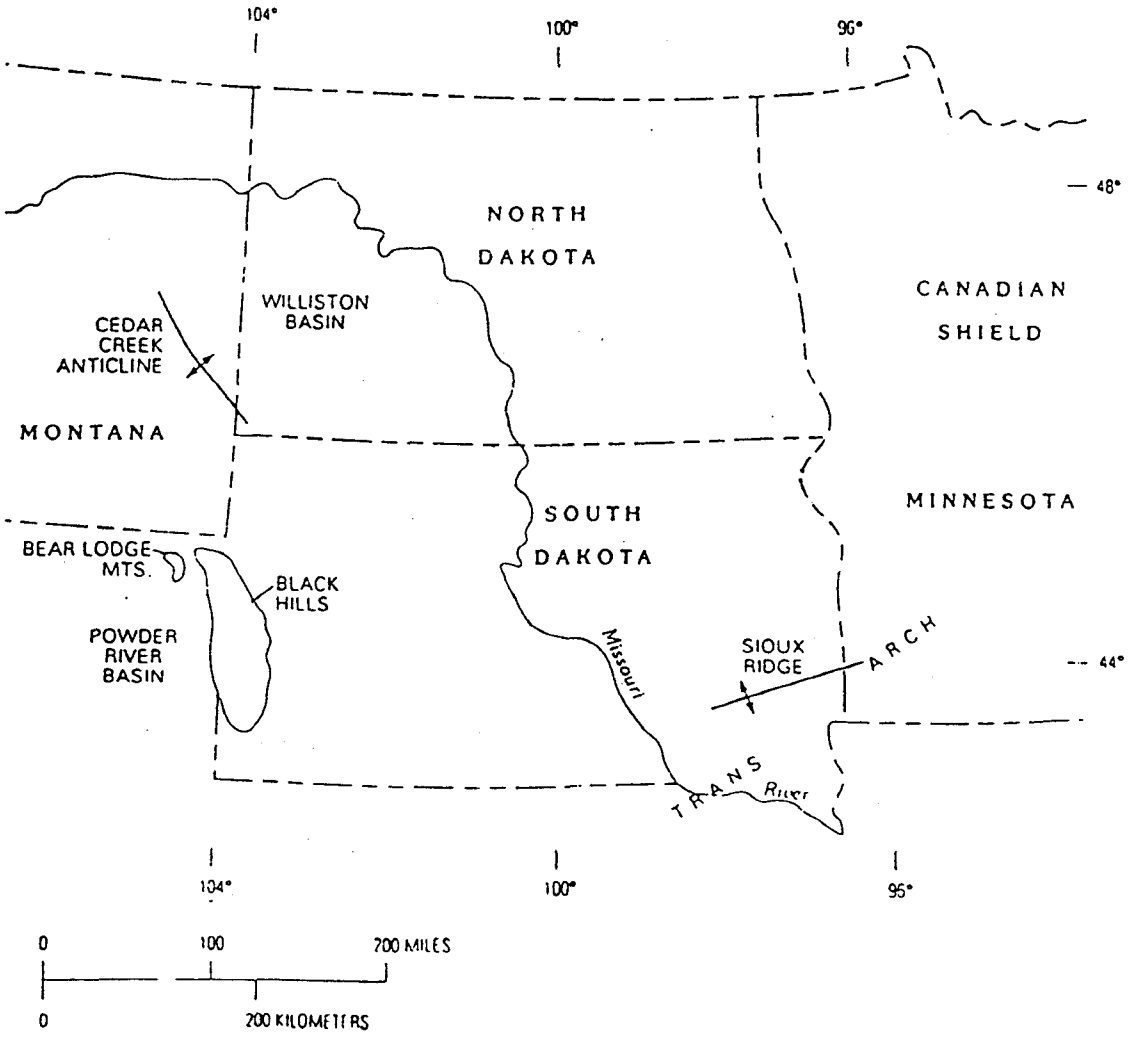

Figure 26. Map showing regional structural features of the upper Midwest (after Dyman et al., 1994).

It seems likely that the majority of the Newcastle sediments were derived from the Dakota Formation, with minor amounts of input from the Precambrian Shield exposures, the Sioux Quartzite, and perhaps the Transcontinental Arch. One would expect the majority of influx from the Precambrian Shield to be near the northern and extreme eastern regions of North Dakota. The other sources, especially those of the nearby Dakota Formation, would probably make up the majority of the Newcastle clastics in the southern regions of the study area, and also make up the primary component of the redistributed sheet sands of the north-central parts of the study area.

Hydrocarbon Potential

Earliest oil production from the Newcastle or its equivalent units began in the late 1800's in Wyoming (Guess and Swirczynski, 1968). Hydrocarbon production within the upper Midwest has been greatest in the Powder River Basin. The relatively shallow depths of the unit, combined with high rates of production, excellent market conditions, and low drilling costs made the Muddy Sandstone a major target for exploration in the late 1800's and early to mid 1900's.

Interest in the Newcastle Formation peaked in the mid to late 1960's, as a result of the discovery of Bell Creek Oil Field in southeastern Montana. Bell Creek wells produce from the Muddy Sandstone, the Montana equivalent to the Newcastle of North Dakota. Early studies express the enthusiasm geologists had for discovering a major field in North Dakota (Anderson, 1969) or in South Dakota (Bolyard, 1969).

The same sedimentary characteristics of the Muddy described by Davies and Berg (1969) were presented in a more general sense by Reishus (1967, 1968). He felt that in areas where the Newcastle Formation had good porosity and permeability, one should find ample hydrocarbons. The Mowry Shale acts as an excellent caprock, while the underlying Skull Creek Shale provides sufficient organic content to produce hydrocarbons.

Reishus concluded that the best possibilities for hydrocarbon production were located in areas where the sand thickens and thins over a relatively short distance, as well as those areas where there are up-dip pinchouts of the sand. Bolyard's conclusions were similar to Reishus', and added isolated bar deposits to the list of exploration targets (Bolyard, 1969).

In South Dakota, Muddy production has been fair to good, especially in the western regions of the state, and along the flanks of the Black Hills. In 1972, Robert Schoon published a report on oil possibilities in northwestern South Dakota, with emphasis on the Newcastle Sandstone. The majority of the hydrocarbon production in South Dakota has been in the form of natural gas, with minimal amounts of oil. Schoon was cautiously optimistic about future exploration efforts, noting the poor well control used to generate his maps.

In Canada, the situation appears to be similar. O'Connell (1982) discussed the hydrocarbon potential of the Newcastle equivalent, the Viking Sandstone, within southeast Saskatchewan. He felt that up-dip pinchouts are again the best type of features to look for within the unit. He noted the similarity between the Viking and the Newcastle of North Dakota.

Dolson et al. (1991) related hydrocarbon production to paleotopographic trends in the subsurface. Valley fill and channel deposits have been shown to produce the largest volumes of oil. These types of deposits occur within the Newcastle Formation in the study area and in western North Dakota as well.

On the basis of preliminary studies using Time-Temperature Index (TTI) values (Fig. 27), it appears that the Newcastle within the study area has not been buried long enough or deep enough to generate hydrocarbons. Waples (1980) described the limits of both oil and gas generation; the lower limit of oil generation is at a TTI value of 15, while the upper limit is 160. For gas the limits are much higher; the lowest values for wet gas generation are 1,000-1,500, and dry gas generation occurs at values between 1,500 and 65,000. As shown on Figure 27, the highest TTI value calculated was about 1.2, and the lowest approximately 0.2. Although this is only a rough estimate of the TTI values within the area, it appears that the values are an order of magnitude less than would be needed to begin oil generation, and about three orders less than those required for gas generation. Therefore, Newcastle gas shows described by Sidney Anderson (personal communication, 1994) in eastern North Dakota probably were not due to hydrocarbon maturation within the unit, but may have been caused by the release of biogenic gas.

Poor well control (Fig. 28) and cumbersome software may be partly to blame for the low TTI values. Another factor to consider is the reliability of the temperature gradient data. Bottom hole temperatures do not always provide reliable estimates of the temperature gradients within North Dakota.

Although there is much room for error in this TTI study, the calculated TTI values

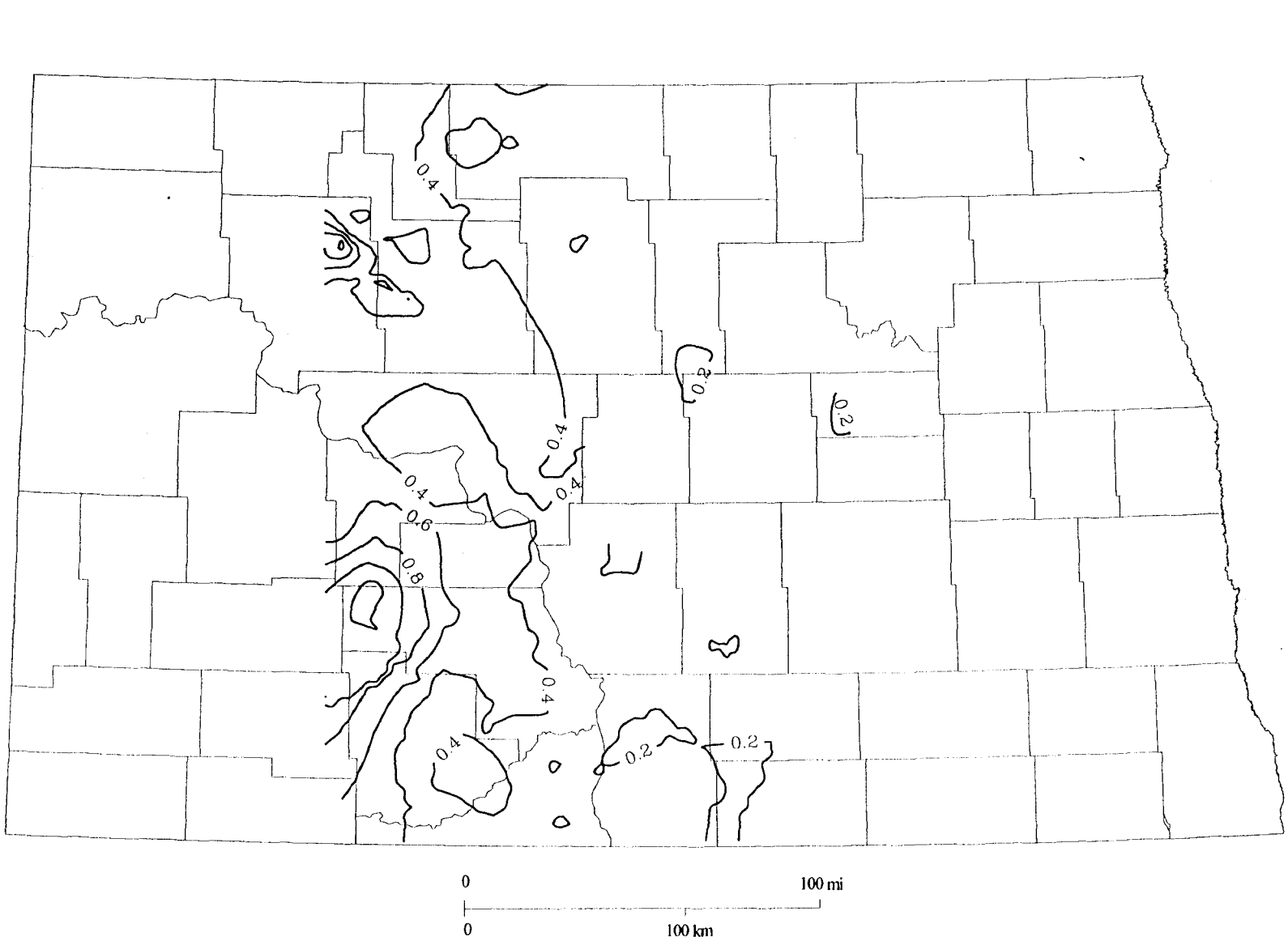

Figure 27. Preliminary contour map of TTI values within the study area (CI=0.2).

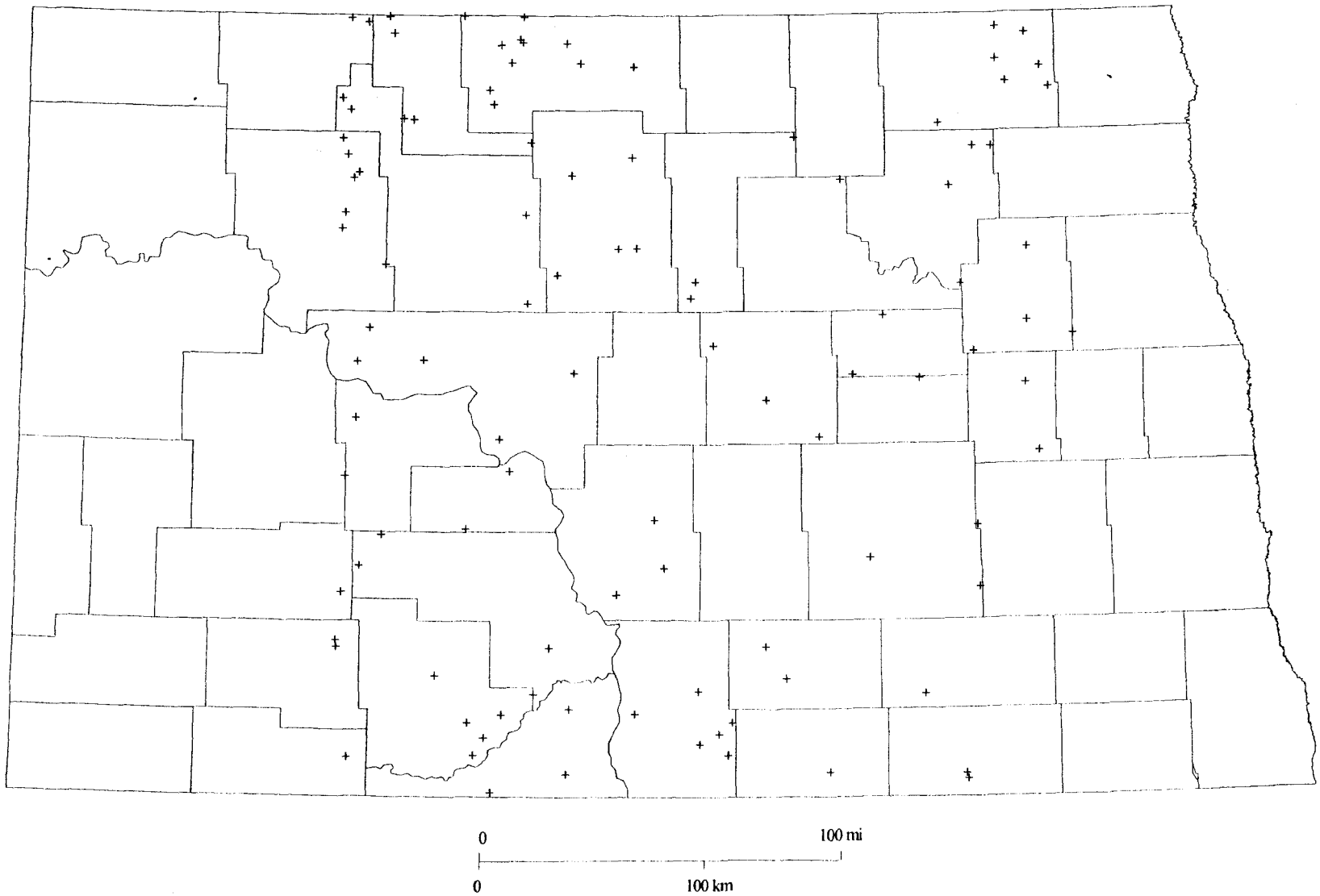

Figure 28. Map showing well control data used for TTI analysis.

are significantly lower than the value needed to begin hydrocarbon generation. Neither better data nor a greater density of control points would be expected to change the values substantially.

Within the western portion of North Dakota, in the deepest part of the basin, it is possible that the early stages of hydrocarbon generation have occurred in the Newcastle. Not only are the units buried to greater depths, but the geothermal gradient is higher than in eastern North Dakota. Confirmation of this hypothesis would require further investigation, using better temperature gradient data and well control, and perhaps the use of vitrinite reflectance methods on the abundant coals and coal chips which occur in cores.

One final factor to consider is the degree to which the Mowry Shale traps the generated hydrocarbons. If hydrocarbons, especially natural gas, have been generated within the western Newcastle Formation, they may be migrating out of the unit due to poor capping by the Mowry. Dave Fischer (operating oil and gas consultant) believes that the only time hydrocarbons are effectively trapped within the Newcastle Formation is when an overlying bentonite layer is present (personal communication, 1995). Without this bentonite, the gas migrates out of the system. Thus, even though the Mowry should act as an excellent cap rock, it may not be as effective as it appears. As noted during core examination, the Mowry is often highly fractured. Hydrocarbons may have been generated within the Newcastle, but may not have been trapped unless the bentonite layer is also present to seal the fractures. This could account for the general irregular pattern of gas shows within the Williston Basin.

SUGGESTIONS FOR FUTURE WORK

Future study is needed in several areas. One possibility for future work involves relating the depositional history of the Skull Creek sands to the Newcastle. With greater well control in the eastern part of the state, better correlations can be made between the two units. This would help to determine Skull Creek highstand shoreline position better also.

A second possibility for future work is the development of a more widespread, regional scenario, such as relating provenances of the extreme northeastern portion of the state to the overall depositional history of the Newcastle Formation. Extending this study into the neighboring Canadian Provinces, South Dakota, and Minnesota also could be undertaken.

A better way to analyze hydrocarbon potential of the unit is also necessary. Using vitrinite reflectance indices to determine the thermal maturity of the Newcastle Formation may provide ways to locate possible hydrocarbon reserves within the state.

Provenance of the Newcastle could perhaps be more decisively determined with a detailed study of the Precambrian crystalline rocks, Dakota Formation, and Sioux Quartzite. Specific mineralogic assemblages within each possible source could be determined and then compared to the Newcastle sediments. Extensive petrographic work would be necessary for this type of study.

Again, more core control is needed to facilitate any of these studies. Without considerably more drilling, especially in the eastern part of North Dakota, western Minnesota, and eastern South Dakota, it will remain difficult to effectively study the Newcastle Formation.

CONCLUSIONS

The Newcastle Formation in the eastern two thirds of North Dakota is composed of fine-grained sandstone, mudstone, and shale. Four depositional environments can be interpreted from analyzing numerous well logs, lithologic cores, and isopach maps created using the data available; these include shallow marine, nearshore, deltaic, and fluvial environments.

Approximately 99 Ma, the Cretaceous Interior Seaway covered most, if not all of North Dakota. It was during this time that the Skull Creek Shale was deposited. As the sea retreated to the northwest, it exposed the shales recently deposited to erosion. During maximum lowstand position of the Skull Creek-Newcastle Seaway (97 Ma), a considerable drainage system developed on the Skull Creek Shale of west-central South Dakota, northwestern Wyoming, eastern Montana, and western North Dakota. This drainage delivered large volumes of quartz-rich sand to western North Dakota and eastern Montana from the unroofing of the Lower Cretaceous Dakota Formation in east-central South Dakota. These sands were deposited as nearshore bars and deltas as they emptied into the sea.

Sea level began to rise again, transgressing over North Dakota, redistributing the Dakota sands as thin blanket-like sheet sandstones of the Newcastle Formation. The sea advanced for approximately 300,000-500,000 years, reaching a stillstand position in

eastern North Dakota. The reworked Dakota sediments were nearly if not totally redistributed at this point.

During stillstand, sediments were probably delivered to the system from one or more of three source areas: the Dakota Sandstone of eastern South Dakota, the Sioux Quartzite of northeastern Iowa, or from the Precambrian Shield probably exposed in nearby Minnesota or North Dakota. These clastic sediments were deposited in one of three ways: in eastern North Dakota parallel to the Minnesota-North Dakota border as nearshore deposits, and in south-central and southeastern North Dakota either as deltaic deposits or as fluvial deposits that capped both the deltaic and some of the nearshore deposits.

Near the end of Newcastle deposition, the sea again began to rise, transgressing into Minnesota and perhaps South Dakota. The Newcastle Formation was covered by the Mowry Shale in a shallow epeiric seaway that began to dominate the area approximately 96.5-96 Ma.

Appendices

APPENDIX A - WELL DATA

The abbreviation WELL# is the well number given by either the state or province when it was drilled. For wells that did not have any particular number assigned to them, arbitrary numbers were assigned as follows: 20,000-series wells: Manitoba, 25,000-series wells: Saskatchewan, 15,000-series wells: South Dakota, 14,000-series wells: North Dakota-Minnesota Stratigraphic Test wells. Other abbreviations within Appendix A: TWP-Township, RNG-Range, SEC-Section, QTR-Quarter, KB-Kelly Bushing, KP-Pierre Shale top, KG-Greenhorn Formation top, KM-Mowry Shale top, KNWC-Newcastle Formation top, KSC-Skull Creek Shale top, KIK-Inyan Kara Formation top, n/a-well top unavailable or undeterminable, undiffer-undifferentiable, absent-formation missing from well.

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
20001	1	7	29	1	Manitoba	1554	n/a	n/a	630	928	1001	1031	1080
20002	1	12	24	13	Manitoba	1536	n/a	498	865	1110	absent	undiffer	1202
20003	1	16	11	3	Manitoba	1690	392	886	1200	1445	absent	undiffer	1575
20004	1	18	36	13	Manitoba	1836	n/a	1103	1437	1675	absent	undiffer	1810
20005	1	20	4	16	Manitoba	2211	595	1602	1970	2215	absent	undiffer	2351
20006	1	20	6	9	Manitoba	2249	637	1648	2019	2270	absent	undiffer	2415
20007	1	20	26	14	Manitoba	2247	n/a	1630	1980	2237	absent	undiffer	2370
20008	1	20	29	14	Manitoba	2233	620	1590	1982	2235	absent	undiffer	2388
20010	1	21	14	14	Manitoba	2288	643	1670	2060	2320	absent	undiffer	2478
20009	1	21	14	9	Manitoba	2260	635	1660	2048	2301	absent	undiffer	2454
20011	1	21	17	3	Manitoba	2239	550	1640	2036	2281	absent	undiffer	2448
20012	1	21	23	2	Manitoba	2283	628	1665	2060	2315	absent	undiffer	2475
20013	1	21	36	4	Manitoba	2287	635	1619	2040	2298	absent	undiffer	2455
20014	1	23	21	10	Manitoba	2151	550	1372	2040	2277	absent	undiffer	2460
20015	1	24	28	1	Manitoba	1636	n/a	1095	1549	1788	absent	undiffer	1975
20016	1	24	33	2	Manitoba	1615	n/a	1070	1510	1758	absent	undiffer	1938
20017	1	25	1	13	Manitoba	1543	433	910	1559	1794	absent	undiffer	1968
20018	1	25	8	16	Manitoba	1545	n/a	955	1562	1820	absent	undiffer	2000
20019	1	25	14	10	Manitoba	1567	n/a	938	1533	1785	absent	undiffer	1949
20020	1	25	15	16	Manitoba	1557	n/a	938	1540	1790	absent	undiffer	1965
20021	1	25	18	13	Manitoba	1544	n/a	955	1566	1808	absent	undiffer	1992
20022	1	25	19	10	Manitoba	1543	n/a	1032	1550	1806	absent	undiffer	1981
20023	1	25	22	2	Manitoba	1558	n/a	1031	1561	1807	absent	undiffer	1989
20024	1	25	23	10	Manitoba	1555	n/a	1000	1535	1777	absent	undiffer	1940
20025	1	25	29	11	Manitoba	1559	n/a	1038	1578	1822	1889	1892	2001
20026	1	25	30	1	Manitoba	1550	n/a	1030	1570	1815	absent	undiffer	1995
20027	1	25	31	4	Manitoba	1545	n/a	1025	1550	1794	absent	undiffer	1975
20028	1	25	32	3	Manitoba	1554	n/a	1030	1542	1782	absent	undiffer	1969
20029	1	25	33	14	Manitoba	1568	n/a	1038	1540	1770	absent	undiffer	1949
20030	1	25	35	4	Manitoba	1565	n/a	1070	1525	1751	absent	undiffer	1926
20031	1	26	1	4	Manitoba	1527	n/a	1155	1590	1840	absent	undiffer	2025
20032	1	26	2	2	Manitoba	1526	n/a	1180	1620	1860	1921	1924	2048
20033	1	26	10	1	Manitoba	1520	n/a	1188	1621	1881	1932	1935	2067
20034	1	26	13	9	Manitoba	1538	n/a	965	1561	1805	absent	undiffer	1980
20035	1	26	16	7	Manitoba	1510	n/a	970	1610	1850	1903	1906	2030
20036	1	26	18	16	Manitoba	1429	n/a	890	1540	1771	absent	undiffer	1961
20037	1	26	20	2	Manitoba	1492	n/a	940	1582	1821	absent	undiffer	2012
20038	1	26	21	6	Manitoba	1514	n/a	955	1590	1829	absent	undiffer	2010
20039	1	26	22	5	Manitoba	1524	n/a	953	1586	1831	1898	1901	2016
20040	1	26	25	8	Manitoba	1548	n/a	958	1570	1810	absent	undiffer	2000
20041	1	26	34	10	Manitoba	1522	n/a	930	1550	1790	1859	1861	1972
20042	1	26	36	2	Manitoba	1544	n/a	955	1542	1792	absent	undiffer	1973
20043	1	27	2	3	Manitoba	1486	n/a	982	1649	1886	absent	undiffer	2076
20044	1	27	3	1	Manitoba	1495	n/a	1017	1685	1916	1985	1989	2111
20045	1	27	9	12	Manitoba	1510	n/a	1000	1675	1917	absent	undiffer	2101
20046	1	27	16	16	Manitoba	1497	n/a	990	1667	1904	absent	undiffer	2107
20047	1	27	21	8	Manitoba	1495	n/a	968	1639	1869	absent	undiffer	2066
20048	1	27	22	12	Manitoba	1485	n/a	942	1636	1870	absent	undiffer	2054
20049	1	27	27	7	Manitoba	1498	n/a	978	1648	1879	absent	undiffer	2073
20050	1	28	3	1	Manitoba	1503	n/a	1049	1721	1977	absent	undiffer	2180
20051	1	28	4	3	Manitoba	1517	n/a	1086	1751	2015	2080	2083	2218
20052	1	28	13	11	Manitoba	1481	n/a	995	1675	1919	absent	undiffer	2105
20053	1	28	16	1	Manitoba	1512	n/a	1068	1725	1975	absent	undiffer	2180
20054	1	28	17	5	Manitoba	1519	n/a	1080	1748	1998	absent	undiffer	2199
20055	1	28	29	15	Manitoba	1516	n/a	1050	1737	1976	absent	undiffer	2172
20056	1	28	33	3	Manitoba	1524	n/a	1031	1730	1963	absent	undiffer	2151
20057	1	29	5	15	Manitoba	1573	n/a	1170	1862	2127	absent	undiffer	2340
20058	1	29	15	8	Manitoba	1538	n/a	1132	1820	2080	absent	undiffer	2299
20059	1	29	34	5	Manitoba	1589	n/a	1168	1800	2061	absent	undiffer	2272
25001	1	30	2	3	Saskatch	1585	n/a	n/a	1950	2220	absent	undiffer	2433
25002	1	30	5	7	Saskatch	1604	n/a	n/a	2012	2273	absent	undiffer	2550
25003	1	30	6	1	Saskatch	1613	n/a	n/a	2020	2271	absent	undiffer	2506
25004	1	30	17	5	Saskatch	1586	n/a	1460	1980	2248	absent	undiffer	2470

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
25008	1	30	22	13	Saskatch	1620	n/a	n/a	1958	2209	absent	undiffer	2440
25005	1	30	29	16	Saskatch	1618	n/a	1435	1948	2207	absent	undiffer	2429
25006	1	30	30	11	Saskatch	1626	n/a	n/a	1979	2230	absent	undiffer	2455
25007	1	30	31	11	Saskatch	1631	n/a	n/a	1971	2229	absent	undiffer	2456
25009	1	31	1	1	Saskatch	1616	n/a	n/a	2055	2313	absent	undiffer	2561
25011	1	31	2	13	Saskatch	1629	n/a	n/a	2070	2335	absent	undiffer	2585
25012	1	31	3	1	Saskatch	1635	n/a	n/a	2112	2372	absent	undiffer	2608
25013	1	31	4	1	Saskatch	1631	n/a	n/a	2090	2378	absent	undiffer	2628
25014	1	31	5	1	Saskatch	1645	n/a	n/a	2171	2431	absent	undiffer	2688
25015	1	31	6	3	Saskatch	1627	n/a	n/a	2165	2420	absent	undiffer	2650
25016	1	31	7	5	Saskatch	1657	n/a	n/a	2178	2433	absent	undiffer	2655
25017	1	31	8	1	Saskatch	1642	n/a	n/a	2139	2396	absent	undiffer	2640
25018	1	31	9	1	Saskatch	1641	n/a	n/a	2125	2388	2460	2466	2628
25019	1	31	10	1	Saskatch	1631	n/a	n/a	2060	2345	absent	undiffer	2600
25020	1	31	12	13	Saskatch	1603	n/a	n/a	2030	2291	absent	undiffer	2530
25021	1	31	13	13	Saskatch	1614	n/a	n/a	2015	2270	2345	2352	2500
25010	1	31	13	3	Saskatch	1630	n/a	n/a	2022	2291	absent	undiffer	2540
25022	1	31	15	11	Saskatch	1635	n/a	n/a	2050	2301	absent	undiffer	2545
25023	1	31	16	5	Saskatch	1641	n/a	n/a	2097	2343	absent	undiffer	2582
25024	1	31	17	1	Saskatch	1643	n/a	n/a	2112	2360	2445	2455	2610
25025	1	31	18	5	Saskatch	1663	n/a	1699	2165	2421	2509	2520	2660
25026	1	31	19	5	Saskatch	1656	n/a	1672	2130	2387	2470	2485	2635
25027	1	31	20	5	Saskatch	1650	n/a	1645	2110	2350	2435	2446	2599
25028	1	31	23	15	Saskatch	1628	n/a	1617	2038	2290	absent	undiffer	2530
25029	1	31	25	3	Saskatch	1629	n/a	1558	2000	2252	absent	undiffer	2480
25030	1	31	26	15	Saskatch	1644	n/a	1581	2035	2291	absent	undiffer	2525
25031	1	31	27	3	Saskatch	1631	n/a	1600	2047	2302	absent	undiffer	2540
25032	1	31	28	9	Saskatch	1641	n/a	1591	2051	2310	absent	undiffer	2546
25033	1	31	29	3	Saskatch	1648	n/a	1640	2093	2341	absent	undiffer	2558
25034	1	31	30	1	Saskatch	1650	n/a	1652	2109	2362	absent	undiffer	2611
25035	1	31	32	11	Saskatch	1649	n/a	1580	2060	2311	absent	undiffer	2545
25036	1	31	33	16	Saskatch	1639	n/a	1580	2030	2291	absent	undiffer	2549
25037	1	31	35	1	Saskatch	1642	n/a	1565	2021	2268	absent	undiffer	2498
25038	1	31	36	5	Saskatch	1631	n/a	1540	1990	2240	absent	undiffer	2470
25039	1	32	1	1	Saskatch	1633	n/a	1720	2175	2430	absent	undiffer	2670
25040	1	32	2	1	Saskatch	1645	n/a	1749	2218	2481	2558	2568	2712
25041	1	32	3	9	Saskatch	1672	n/a	1768	2233	2493	2575	2586	2745
25042	1	32	4	3	Saskatch	1673	n/a	1798	2270	2521	2610	2621	2770
25043	1	32	5	3	Saskatch	1697	n/a	1856	2315	2565	2649	2661	2820
25044	1	32	8	3	Saskatch	1696	n/a	1845	2303	2555	2642	2654	2810
25045	1	32	9	11	Saskatch	1686	n/a	1785	2253	2508	2590	2600	2756
25046	1	32	10	3	Saskatch	1670	n/a	1730	2230	2480	2562	2575	2730
25047	1	32	11	3	Saskatch	1646	n/a	1735	2190	2450	2532	2548	2705
25048	1	32	12	3	Saskatch	1658	n/a	1725	2190	2450	absent	undiffer	2671
25049	1	32	13	7	Saskatch	1661	n/a	1760	2172	2435	2518	2530	2692
25050	1	32	14	7	Saskatch	1669	n/a	1760	2180	2431	2510	2522	2651
25051	1	32	15	15	Saskatch	1657	n/a	1730	2185	2435	2522	2536	2690
25052	1	32	16	13	Saskatch	1688	n/a	1795	2270	2511	2592	2603	2770
25053	1	32	19	5	Saskatch	1706	n/a	1842	2325	2580	2652	2667	2840
25054	1	32	20	5	Saskatch	1698	n/a	1808	2296	2542	2628	2641	2808
25055	1	32	22	1	Saskatch	1646	n/a	1733	2160	2412	2498	2508	2650
25056	1	32	23	1	Saskatch	1667	n/a	1745	2183	2440	2530	2542	2695
25057	1	32	24	1	Saskatch	1662	n/a	1686	2150	2403	absent	undiffer	2685
25058	1	32	26	3	Saskatch	1667	n/a	1730	2175	2433	2512	2527	2681
25059	1	32	27	1	Saskatch	1671	n/a	1740	2188	2440	2530	2541	2706
25060	1	32	28	7	Saskatch	1676	n/a	1755	2231	2491	2572	2590	2765
25061	1	32	29	15	Saskatch	1680	n/a	1796	2265	2517	2598	2612	2780
25062	1	32	30	13	Saskatch	1704	n/a	1831	2290	2530	2615	2630	2790
25063	1	32	31	9	Saskatch	1703	n/a	1821	2281	2535	2610	2622	2800
25064	1	32	32	1	Saskatch	1683	n/a	1783	2249	2498	2581	2592	2766
25065	1	32	33	1	Saskatch	1679	n/a	1740	2210	2463	2542	2549	2722
25066	1	32	34	3	Saskatch	1677	n/a	1741	2211	2425	2506	2521	2705
25067	1	32	35	3	Saskatch	1673	n/a	1710	2170	2426	2510	2528	2678

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
25068	1	32	36	13	Saskatch	1667	n/a	1680	2122	2372	2461	2472	2621
25069	1	33	1	5	Saskatch	1740	n/a	1970	2451	2710	2791	2806	2982
25070	1	33	5	9	Saskatch	1774	n/a	2035	2540	2800	2885	2900	3081
25071	1	33	7	9	Saskatch	1781	n/a	2242	2560	2830	2910	2923	3103
25072	1	33	8	1	Saskatch	1772	660	2050	2520	2780	2870	2885	3051
25073	1	33	9	7	Saskatch	1767	635	2025	2503	2761	2852	2870	3040
25074	1	33	10	7	Saskatch	1752	570	2160	2480	2740	2830	2844	3010
25075	1	33	11	15	Saskatch	1740	n/a	1936	2431	2688	2771	2788	2965
25076	1	33	12	1	Saskatch	1726	n/a	1920	2406	2660	2740	2753	2925
25077	1	33	13	1	Saskatch	1725	n/a	1872	2362	2611	2695	2710	2880
25078	1	33	16	7	Saskatch	1757	530	1960	2485	2750	2840	2856	3022
25079	1	33	17	7	Saskatch	1782	610	2210	2522	2789	2876	2892	3067
25080	1	33	18	7	Saskatch	1781	638	2225	2537	2802	2878	2893	3080
25081	1	33	19	1	Saskatch	1781	n/a	2193	2500	2763	absent	undiffer	3042
25082	1	33	23	9	Saskatch	1728	n/a	2065	2361	2603	2690	2700	2868
25083	1	33	25	5	Saskatch	1713	n/a	2022	2321	2568	2651	2665	2830
25084	1	33	26	3	Saskatch	1729	n/a	2070	2371	2630	2712	2730	2895
25085	1	33	28	3	Saskatch	1760	n/a	2149	2460	2719	2809	2822	2998
25086	1	33	29	3	Saskatch	1779	n/a	2151	2471	2730	absent	undiffer	3005
25087	1	33	30	10	Saskatch	1790	n/a	2172	2480	2740	absent	undiffer	3010
25088	1	33	31	3	Saskatch	1781	n/a	2161	2470	2736	2810	2829	2998
25089	1	33	35	3	Saskatch	1743	n/a	2060	2360	2605	2685	2700	2875
25090	1	33	36	15	Saskatch	1713	n/a	2020	2310	2560	2640	2653	2828
25091	1	34	8	6	Saskatch	1818	710	2345	2650	2917	3008	3018	3180
25092	1	34	11	9	Saskatch	1805	710	2295	2610	2878	absent	undiffer	3160
25093	1	34	21	9	Saskatch	1760	n/a	2200	2505	2760	absent	undiffer	3050
25094	1	34	23	11	Saskatch	1812	672	2251	2567	2825	absent	undiffer	3100
25095	1	34	24	1	Saskatch	1794	n/a	2235	2550	2813	absent	undiffer	3095
25096	1	34	25	15	Saskatch	1792	n/a	2175	2480	2745	absent	undiffer	3028
25097	1	34	27	12	Saskatch	1819	880	2240	2545	2801	absent	undiffer	3072
25098	1	34	33	13	Saskatch	1700	n/a	2160	2422	2678	absent	undiffer	2960
25099	1	34	34	11	Saskatch	1809	n/a	2231	2532	2791	absent	undiffer	3070
25100	1	34	36	1	Saskatch	1787	n/a	2180	2480	2736	absent	undiffer	3010
20060	2	14	32	4	Manitoba	1532	n/a	n/a	930	1160	absent	undiffer	1275
20061	2	15	5	13	Manitoba	1561	n/a	n/a	1020	1262	absent	undiffer	1385
20062	2	15	14	2	Manitoba	1540	n/a	n/a	975	1211	absent	undiffer	1332
20063	2	20	15	8	Manitoba	1913	n/a	1251	1593	1838	absent	undiffer	1983
20064	2	22	11	8	Manitoba	2124	n/a	1333	1908	2165	absent	undiffer	2330
20065	2	23	3	2	Manitoba	2129	n/a	1310	1938	2232	absent	undiffer	2407
20066	2	23	31	10	Manitoba	1646	n/a	n/a	1439	1638	absent	undiffer	1810
20067	2	23	34	13	Manitoba	1657	n/a	n/a	1440	1680	absent	undiffer	1849
20068	2	26	4	6	Manitoba	1520	n/a	920	1561	1805	absent	undiffer	1990
20069	2	26	10	8	Manitoba	1533	n/a	933	1563	1800	absent	undiffer	1985
20070	2	26	14	15	Manitoba	1535	n/a	928	1555	1801	absent	undiffer	1972
20071	2	26	16	6	Manitoba	1519	n/a	1021	1565	1802	absent	undiffer	1986
20072	2	26	30	2	Manitoba	1437	n/a	928	1471	1708	absent	undiffer	1895
20073	2	26	32	5	Manitoba	1490	n/a	1006	1531	1768	absent	undiffer	1951
20074	2	26	36	10	Manitoba	1540	n/a	854	1475	1706	absent	undiffer	1880
20075	2	27	2	5	Manitoba	1490	n/a	962	1628	1852	absent	undiffer	2030
20076	2	27	18	2	Manitoba	1502	n/a	951	1630	1858	absent	undiffer	2045
20077	2	28	2	11	Manitoba	1497	n/a	950	1650	1873	absent	undiffer	2060
20078	2	28	9	16	Manitoba	1514	n/a	996	1695	1921	absent	undiffer	2130
20079	2	28	20	14	Manitoba	1526	n/a	1381	1700	1930	absent	undiffer	2125
20080	2	28	22	1	Manitoba	1505	n/a	1190	1668	1902	absent	undiffer	2090
20081	2	28	27	15	Manitoba	1515	n/a	1330	1658	1895	absent	undiffer	2090
20082	2	28	28	10	Manitoba	1526	n/a	1350	1672	1900	absent	undiffer	2105
20083	2	28	29	16	Manitoba	1534	n/a	1375	1693	1920	absent	undiffer	2124
20084	2	28	34	4	Manitoba	1523	n/a	1332	1659	1891	absent	undiffer	2085
20085	2	29	29	2	Manitoba	1578	n/a	1463	1769	2000	absent	undiffer	2205
20086	2	29	32	15	Manitoba	1581	n/a	1451	1748	1966	absent	undiffer	2175
20087	2	29	36	5	Manitoba	1538	n/a	1391	1703	1928	absent	undiffer	2130
25101	2	30	1	1	Saskatch	1565	n/a	1560	1828	2080	2150	2168	2292
25102	2	30	4	15	Saskatch	1604	n/a	1643	1900	2160	2241	2250	2383

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
25103	2	30	5	14	Saskatch	1631	n/a	1680	1947	2200	absent	undiffer	2420
25104	2	30	14	9	Saskatch	1590	n/a	1578	1850	2090	2165	2180	2310
25105	2	30	15	13	Saskatch	1618	n/a	1615	1865	2112	2187	2194	2328
25106	2	30	17	13	Saskatch	1630	n/a	1638	1899	2140	absent	undiffer	2360
25107	2	30	18	15	Saskatch	1635	n/a	1665	1920	2161	absent	undiffer	2382
25108	2	30	19	2	Saskatch	1625	n/a	1641	1905	2142	absent	undiffer	2355
25109	2	30	20	5	Saskatch	1622	n/a	1628	1885	2133	absent	undiffer	2340
25110	2	30	21	12	Saskatch	1614	n/a	1611	1871	2111	absent	undiffer	2330
25111	2	30	28	3	Saskatch	1625	n/a	1606	1870	2105	2182	2192	2321
25112	2	30	29	3	Saskatch	1605	n/a	1598	1849	2090	absent	undiffer	2310
25113	2	30	30	1	Saskatch	1635	n/a	1628	1882	2120	2200	2220	2340
25114	2	30	33	5	Saskatch	1626	n/a	1593	1835	2092	2157	2172	2301
25115	2	30	34	5	Saskatch	1620	n/a	1568	1831	2060	2135	2152	2268
25116	2	31	1	3	Saskatch	1626	n/a	1715	1973	2230	2306	2321	2451
25117	2	31	16	5	Saskatch	1659	n/a	1770	2023	2280	2365	2371	2512
25118	2	31	19	3	Saskatch	1670	n/a	1780	2040	2292	2327	2332	2528
25119	2	31	21	9	Saskatch	1678	n/a	1751	2005	2252	2299	2311	2479
25120	2	31	22	7	Saskatch	1662	n/a	1745	1996	2250	2291	2312	2471
25121	2	31	23	3	Saskatch	1650	n/a	1722	1980	2241	2282	2294	2460
25123	2	31	27	3	Saskatch	1667	n/a	1730	1987	2235	2274	2284	2458
25124	2	31	28	1	Saskatch	1681	n/a	1752	2021	2269	2311	2322	2493
25125	2	31	29	3	Saskatch	1669	n/a	1760	2020	2273	2317	2322	2501
25126	2	31	34	7	Saskatch	1662	n/a	1720	1981	2225	2270	2283	2450
25141	2	31	35	11	Saskatch	1653	n/a	1690	1949	2190	2265	2280	2410
25122	2	31	36	11	Saskatch	1649	n/a	1698	1961	2211	absent	undiffer	2435
25142	2	31	36	3	Saskatch	1655	n/a	1683	1943	2189	2261	2271	2405
25143	2	32	1	5	Saskatch	1672	n/a	1860	2130	2382	2463	2483	2630
25144	2	32	2	1	Saskatch	1671	n/a	1870	2142	2406	2485	2500	2650
25145	2	32	3	1	Saskatch	1681	n/a	1910	2195	2450	2538	2552	2710
25146	2	32	4	1	Saskatch	1686	n/a	1920	2200	2455	2540	2555	2720
25147	2	32	5	1	Saskatch	1674	n/a	1950	2231	2490	2580	2593	2763
25148	2	32	6	1	Saskatch	1713	n/a	1983	2272	2520	2605	2620	2782
25149	2	32	7	11	Saskatch	1703	n/a	1967	2243	2492	2579	2591	2762
25150	2	32	8	3	Saskatch	1697	n/a	1966	2243	2496	2583	2600	2762
25151	2	32	10	1	Saskatch	1684	n/a	1890	2167	2420	2497	2511	2680
25127	2	32	11	11	Saskatch	1675	n/a	1871	2148	2405	2490	2508	2668
25128	2	32	13	6	Saskatch	1668	n/a	1663	2068	2326	2411	2432	2560
25129	2	32	15	13	Saskatch	1687	n/a	1903	2179	2432	2520	2535	2696
25130	2	32	18	5	Saskatch	1696	n/a	n/a	2212	2470	2541	2559	2728
25131	2	32	25	13	Saskatch	1686	n/a	1870	2070	2320	2402	2412	2572
25132	2	32	29	3	Saskatch	1694	n/a	1911	2183	2420	2508	2523	2680
25133	2	32	30	11	Saskatch	1691	n/a	1918	2181	2425	2511	2533	2685
25134	2	32	33	15	Saskatch	1683	n/a	1850	2111	2362	2440	2452	2593
25135	2	33	1	7	Saskatch	1710	n/a	2010	2291	2545	2628	2640	2808
25136	2	33	2	7	Saskatch	1724	n/a	2028	2315	2570	2660	2678	2830
25137	2	33	3	9	Saskatch	1743	n/a	2058	2340	2597	2680	2691	2857
25138	2	33	4	15	Saskatch	1771	n/a	2112	2391	2648	2728	2750	2908
25139	2	33	5	3	Saskatch	1765	n/a	2141	2435	2695	2772	2791	2961
25140	2	33	6	3	Saskatch	1787	n/a	2152	2456	2715	2798	2815	2980
25152	2	33	8	11	Saskatch	1763	n/a	2100	2395	2652	2738	2757	2926
25153	2	33	9	7	Saskatch	1760	n/a	2094	2370	2626	2708	2718	2890
25154	2	33	10	3	Saskatch	1757	n/a	2085	2353	2609	2688	2706	2870
25155	2	33	11	3	Saskatch	1732	n/a	2043	2312	2565	2648	2658	2823
25156	2	33	12	3	Saskatch	1714	n/a	2014	2288	2541	2616	2631	2800
25157	2	33	14	9	Saskatch	1710	n/a	1988	2249	2500	2583	2604	2761
25158	2	33	15	3	Saskatch	1744	n/a	2048	2322	2572	2655	2678	2842
25159	2	33	16	3	Saskatch	1748	n/a	2089	2360	2601	2690	2709	2877
25160	2	33	17	3	Saskatch	1764	n/a	2100	2381	2632	2730	2742	2912
25161	2	33	18	1	Saskatch	1773	n/a	2111	2383	2646	2735	2749	2918
25162	2	33	19	3	Saskatch	1769	n/a	2079	2356	2603	2696	2719	2880
25163	2	33	20	1	Saskatch	1750	n/a	2051	2325	2579	2654	2671	2845
25164	2	33	21	1	Saskatch	1740	n/a	2031	2300	2556	2630	2651	2815
25165	2	33	23	3	Saskatch	1714	n/a	1991	2256	2503	2591	2611	2750

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
25166	2	33	25	1	Saskatch	1705	n/a	1949	2212	2460	2548	2568	2726
25167	2	33	26	7	Saskatch	1723	n/a	1970	2238	2487	2563	2581	2749
25168	2	33	27	1	Saskatch	1721	n/a	1991	2253	2503	2582	2603	2770
25169	2	33	28	13	Saskatch	1757	n/a	2020	2293	2542	2627	2649	2815
25170	2	33	29	1	Saskatch	1749	n/a	2038	2309	2562	2641	2667	2831
25171	2	33	30	1	Saskatch	1766	n/a	2050	2328	2580	2661	2681	2850
25172	2	33	31	12	Saskatch	1786	n/a	2052	2318	2560	2651	2664	2840
25173	2	33	32	5	Saskatch	1769	n/a	2028	2290	2533	2621	2645	2802
25174	2	33	34	5	Saskatch	1735	n/a	1980	2247	2491	2571	2590	2760
25175	2	34	1	1	Saskatch	1785	n/a	2160	2460	2710	2795	2814	2990
25177	2	34	1	11	Saskatch	1792	n/a	2161	2463	2711	2802	2823	2990
25176	2	34	1	7	Saskatch	1788	n/a	2158	2456	2710	2795	2806	2981
25178	2	34	4	15	Saskatch	1745	n/a	2150	2449	2700	2792	2805	2986
25179	2	34	5	9	Saskatch	1651	n/a	2078	2361	2620	2710	2730	2894
25180	2	34	8	1	Saskatch	1684	n/a	2099	2385	2641	2732	2755	2927
25181	2	34	9	3	Saskatch	1666	n/a	2053	2351	2610	2702	2720	2900
25182	2	34	11	3	Saskatch	1790	n/a	2152	2446	2695	2780	2800	2970
25183	2	34	12	15	Saskatch	1784	n/a	2114	2418	2672	2760	2782	2950
25184	2	34	13	1	Saskatch	1778	n/a	2100	2397	2645	2730	2752	2921
25185	2	34	15	9	Saskatch	1782	n/a	2138	2422	2672	2760	2781	2952
25186	2	34	20	7	Saskatch	1661	n/a	2017	2303	2549	2640	2661	2821
25187	2	34	21	9	Saskatch	1809	n/a	2138	2418	2660	2750	2768	2938
25188	2	34	22	1	Saskatch	1799	n/a	2140	2411	2661	2752	2765	2936
25189	2	34	23	1	Saskatch	1789	n/a	2107	2388	2634	2724	2749	2911
25190	2	34	24	3	Saskatch	1782	n/a	2090	2386	2632	2725	2748	2911
25191	2	34	25	5	Saskatch	1786	n/a	2080	2372	2621	2707	2731	2900
25192	2	34	26	3	Saskatch	1811	n/a	2110	2395	2647	2740	2762	2929
25193	2	34	27	1	Saskatch	1803	n/a	2111	2390	2638	2731	2751	2926
25194	2	34	28	1	Saskatch	1815	n/a	2138	2420	2659	2749	2771	2931
25195	2	34	29	1	Saskatch	1817	n/a	2155	2430	2670	2761	2780	2942
25196	2	34	32	6	Saskatch	1802	n/a	2130	2410	2656	2747	2768	2933
25197	2	34	33	1	Saskatch	1818	n/a	2120	2399	2633	2725	2740	2912
25198	2	34	34	3	Saskatch	1813	n/a	2121	2381	2628	2712	2737	2905
25199	2	34	35	1	Saskatch	1805	n/a	2062	2342	2591	2682	2708	2872
25200	2	34	36	7	Saskatch	1785	n/a	n/a	2321	2570	2660	2683	2853
15001	118	72	20	NENE	Faulk	1940	n/a	840	1185	1420	1545	1845	1955
15006	118	78	34		Potter	1875	n/a	838	1260	1483	1587	1900	2068
15005	119	78	27		Potter	1899	n/a	910	1331	1522	1658	1938	2100
15002	120	75	7	NWNW	Potter	2025	n/a	930	1398	1610	1745	2014	2171
15004	121	77	14	NWNW	Walworth	1881	n/a	890	1321	1589	1710	1935	2082
15003	123	76	36	NESE	Walworth	2032	n/a	1015	1498	1780	1885	2102	2240
515	129	63	11	SENW	Dickey	1441	n/a	380	725	1020	1036	1291	1360
1394	129	66	22	NWNW	Dickey	2196	n/a	1108	1540	1840	1890	2130	2215
4549	129	69	10	SESW	McIntosh	2038	418	1055	1495	1820	1899	2040	n\a
1391	129	70	5	NWNE	McIntosh	2042	546	1025	1555	1873	1980	2086	2188
5714	129	71	3	SESE	McIntosh	2085	n/a	1068	1622	1890	2048	2153	n\a
6311	129	81	26	NENE	Sioux	2215	480	1657	2245	2655	2755	2789	2958
7930	129	84	28	SWSW	Sioux	2338	n/a	2040	2540	3015	3092	3102	3328
6654	129	85	27	SESE	Sioux	2331	n/a	2095	2645	3065	3148	3205	3408
682	130	63	34	SESE	Dickey	1461	n/a	405	750	1055	1069	1304	1388
620	130	69	13	NESE	McIntosh	2042	n/a	1079	1490	1815	1919	2028	2130
621	130	69	19	NWNW	McIntosh	2056	n/a	1057	1545	1855	1948	2075	2180
619	130	69	33	SWNW	McIntosh	2024	380	1092	1487	1808	1909	2025	2128
5715	130	70	11	NENW	McIntosh	2142	540	1058	1550	1890	1980	2070	n\a
5713	130	70	29	SWNE	McIntosh	2025	n/a	1084	1530	1891	1935	2075	n\a
4629	130	74	3	SESE	Emmons	2004	n/a	1077	1712	2053	2119	2220	2351
8832	130	76	26	SENW	Emmons	1839	368	1010	1611	1960	2109	2129	n\a
4850	130	78	28	NENE	Emmons	1815	n/a	1142	1752	2105	2237	2252	n\a
6143	130	81	32	SWSW	Sioux	2190	n/a	1725	2290	2700	2755	2792	2995
4969	130	86	1	SWSW	Grant	1995	n/a	1868	2448	2877	2951	3009	3190
5118	130	88	23	NWSW	Grant	2206	n/a	2190	2745	3127	3210	3302	3455
4951	130	88	35	NESE	Grant	2136	n/a	2020	2589	3031	3105	3170	3355
6322	130	91	7	NESW	Adams	2453	1220	2856	3367	3820	3940	3958	4153

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
4550	131	67	1	SENE	McIntosh	2009	428	968	1423	1693	1808	1934	n\a
622	131	69	17	SWNW	McIntosh	2143	n/a	1238	1635	1950	2055	2145	2250
89	131	73	15	NENE	McIntosh	2176	n/a	1222	1843	2175	2262	2318	2468
4603	131	73	29	NENW	McIntosh	2106	470	1167	1798	2138	2222	2296	2445
4600	131	74	8	NENW	Emmons	1928	361	1086	1660	2010	2141	2170	2302
4601	131	74	14	NWSE	Emmons	2013	n/a	1080	1702	2043	2120	2200	2335
8826	131	75	1	SESW	Emmons	1975	518	1105	1730	2092	2190	2240	n\a
14003	131	75	21	SWSW	Emmons	1949	695	1171	1753	2111	2185	2272	2408
4843	131	77	21	NENE	Emmons	1930	n/a	n/a	1830	2202	2265	2300	2485
631	131	80	29	NESW	Sioux	1731	390	1240	1847	2225	2305	2347	2540
4968	131	85	17	NENE	Grant	2105	600	1987	2573	2982	3055	3098	3310
4953	131	86	9	NWNW	Grant	2009	n/a	1944	2505	2935	3005	3052	3248
4934	131	87	3	SESE	Grant	2174	n/a	2180	2710	3160	3248	3260	3470
4935	131	87	31	SESE	Grant	2451	1023	2395	2993	3424	3502	3508	3735
4960	131	87	35	NENE	Grant	2374	920	2290	2883	3319	3415	3450	3631
5097	131	88	27	NENW	Grant	2531	n/a	2590	3135	3547	3620	3642	3858
9590	131	88	35	NENW	Grant	2519	n/a	2480	3055	3510	absent	undiffer	3808
5033	132	71	33	SWSW	McIntosh	2157	260	1222	1770	2095	2183	2270	n\a
5034	132	72	26	SESE	McIntosh	2155	n/a	1217	1822	2140	2225	2325	n\a
8808	132	74	17	SWNE	Emmons	1919	n/a	n/a	1667	2005	2139	2175	2306
4602	132	74	25	NWNW	Emmons	1960	n/a	1045	1673	2025	2093	2178	2305
4681	132	75	12	SENW	Emmons	1990	n/a	1094	1710	2053	2139	2239	2370
14005	132	75	15	SWSW	Emmons	1925	673	1132	1705	2055	2123	2215	2345
14006	132	75	19	SWSW	Emmons	1807	n/a	1035	1614	1982	2100	2125	2256
7101	132	76	10	SWSW	Emmons	1887	310	1133	1732	2085	2155	2198	2375
43	132	78	8	NESE	Emmons	1820	n/a	1209	1818	2187	2270	2305	2475
4966	132	84	7	SESE	Grant	2066	655	1921	2516	2917	2985	3029	3252
4111	132	84	15	SESE	Grant	1960	n/a	1792	2380	2778	2845	2868	3108
4967	132	85	27	NWNW	Grant	2145	n/a	2115	2638	3038	3110	3131	3370
5113	132	85	29	NWNE	Grant	2257	765	2155	2752	3153	3225	3260	3500
6420	132	86	7	SWSW	Grant	2285	n/a	2303	2867	3294	3372	3380	3608
4928	132	86	17	SESE	Grant	2119	n/a	2150	2705	3100	3178	3190	3420
9591	132	86	19	NENW	Grant	2193	n/a	2275	2851	3195	3275	3303	n\a
5572	132	86	27	NENW	Grant	2172	n/a	2165	2712	3110	3185	3262	3442
3999	133	64	18	NWNW	La Moure	1653	n/a	666	1075	1335	1438	1572	1688
5117	133	66	9	SWSW	La Moure	1970	n/a	1013	1415	1750	1788	1920	2035
5039	133	71	6	SESE	Logan	2059	n/a	1180	1726	2055	2132	2220	n\a
5032	133	71	16	NWNE	Logan	2068	n/a	1248	1716	2041	2122	2221	n\a
1377	133	71	21	NWSW	Logan	2054	n/a	1235	1710	2036	2114	2196	2308
1835	133	72	20	NENW	Logan	2004	n/a	1105	1724	2057	2130	2200	2331
5679	133	74	2	NWNW	Emmons	2128	350	1353	1914	2258	2330	2384	2551
5677	133	74	28	NWNE	Emmons	2035	n/a	1248	1800	2140	2281	2306	n\a
5680	133	75	10	NWNE	Emmons	2041	n/a	1245	1848	2212	2270	2328	2485
8834	133	75	13	SWSE	Emmons	2042	n/a	1221	1830	2185	2250	2295	n\a
14007	133	75	29	SENE	Emmons	1992	480	1218	1816	2185	2246	2280	2452
16	133	75	35	NWSW	Emmons	2027	n/a	1221	1816	2180	2258	2318	2467
14008	133	75	36	SESE	Emmons	1896	n/a	1150	1758	2114	2195	2275	2408
23	133	76	35	NESE	Emmons	2012	265	1280	1856	2210	2290	2342	2502
14009	133	76	35	NESE	Emmons	2001	n/a	1278	1861	2217	2294	2321	2505
14010	133	76	36	SESE	Emmons	1896	675	1168	1758	2113	2194	2277	2408
5305	133	81	35	SWSW	Sioux	1849	n/a	1470	2100	2455	2512	2532	2765
232	133	83	26	SWSW	Grant	1997	545	1759	2349	2743	2809	2840	3070
4701	133	89	19	SWSW	Grant	2437	1091	2800	3365	3809	3885	3935	4128
3636	133	90	1	SWNE	Grant	2350	1228	2795	3333	3768	3844	3900	4117
9586	133	90	2	SWSE	Grant	2370	1405	2828	3352	3791	3868	3928	n\a
1376	134	69	26	NENE	Logan	1954	n/a	1040	1520	1880	1932	1991	2112
1349	134	71	6	NESW	Logan	2111	n/a	1360	1822	2158	2234	2270	2420
1390	134	71	22	SESE	Logan	2013	n/a	1152	1686	2025	2106	2187	2282
1378	134	71	33	NWSW	Logan	2031	n/a	1240	1690	2027	2098	2170	2286
1903	134	72	26	SESE	Logan	1974	n/a	1170	1674	2010	2082	2163	2283
5008	134	72	26	SESW	Logan	1956	218	1053	1657	1990	2063	2145	n\a
5681	134	74	9	NWNW	Emmons	1948	n/a	1150	1784	2138	2211	2270	n\a
5285	134	81	22	NESE	Morton	1721	n/a	1422	2048	2396	2462	2503	2723

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
8630	134	83	2	SESW	Morton	2146	n/a	n/a	2650	2998	3065	3103	3318
8549	134	87	16	SESE	Grant	2293	1730	2505	3065	3510	3598	3617	3822
5496	134	90	5	SENW	Grant	2420	1648	2950	3480	3931	4010	4070	4292
6586	134	90	17	NWNE	Grant	2456	n/a	2977	3520	3960	absent	n\a	n\a
1355	135	72	11	NWNW	Logan	2069	355	1239	1808	2160	2220	2253	2398
5523	135	73	29	NWNW	Logan	2117	425	1283	1915	2258	2328	2398	2542
10369	135	74	22	NWNE	Emmons	1968	n/a	1185	1812	2160	2231	2275	2442
10173	135	76	14	SWSW	Emmons	1956	n/a	1248	1880	2257	2345	2367	2522
10400	135	76	17	SESE	Emmons	2004	n/a	1308	1933	2310	2400	2420	2578
5221	135	80	5	NESW	Morton	2254	n/a	n/a	n/a	2920	2985	3011	3221
464	135	82	11	NWNW	Morton	2134	890	2005	2620	2970	3039	3057	3280
4989	135	82	11	SWNE	Morton	2101	835	1945	2575	2925	2990	3021	3243
3859	135	83	34	SENE	Morton	2124	n/a	2050	2678	3021	3090	3125	3348
4984	135	92	12	NWNE	Hettinger	2524	n/a	3185	3765	4250	4357	4370	4600
4552	136	69	7	SENE	Logan	1881	435	1080	1552	1900	1960	2050	n\a
1346	136	71	8	NWSW	Logan	2022	n/a	1308	1767	2112	2178	2212	2358
1347	136	71	25	NWNW	Logan	1917	n/a	1163	1616	1965	2032	2084	2226
1348	136	71	28	NWSE	Logan	2005	292	1172	1718	2072	2137	2170	2310
590	136	73	6	NWNE	Logan	2011	n/a	1355	1855	2206	2280	2313	2488
4551	136	73	13	NESE	Logan	2048	360	1250	1832	2172	2250	2286	n\a
7936	136	75	13	NWNW	Emmons	1925	n/a	1198	1855	2205	2277	2291	2465
7146	136	75	15	NWNE	Emmons	1908	n/a	1190	1846	2220	2271	2320	2470
7474	136	75	19	SENW	Emmons	1849	n/a	1155	1815	2198	2253	2278	2455
4212	136	76	17	SESE	Emmons	1890	n/a	1268	1900	2275	2339	2361	2538
5979	136	81	18	NWNW	Morton	1907	n/a	1770	2391	2748	2813	2831	3047
5108	136	81	19	SENE	Morton	2017	730	1860	2482	2843	2910	2930	3149
491	136	81	20	NWNE	Morton	1932	n/a	1780	2389	2754	2819	2840	3047
26	136	81	29	NENW	Morton	2005	730	1838	2452	2810	2883	2900	3106
5222	136	81	33	SENE	Morton	1930	606	1718	2335	2698	2760	2785	2999
5555	136	81	34	SENW	Morton	1920	600	1695	2318	2675	2740	2762	2973
5463	136	92	36	SENW	Hettinger	2526	n/a	3210	3790	4271	4315	4402	4585
668	137	67	25	SESW	Stutsman	1907	n/a	n/a	1460	1780	1843	1912	2009
7415	137	67	28	NENE	Stutsman	2001	490	1130	1573	1894	1955	2000	2136
145	137	76	32	NWNW	Burleigh	1869	580	1285	1893	2262	2328	2343	2520
5018	137	82	17	NESE	Morton	1736	720	1880	2540	2831	2940	2970	3122
3978	137	83	34	SENW	Morton	2281	1170	2350	2980	3320	3425	3460	3615
8395	137	87	1	SWSE	Morton	2211	n/a	2649	3285	3708	absent	undiffer	4017
7797	137	87	14	SESE	Morton	2281	n/a	2751	3338	3760	3814	3822	4070
5011	137	87	25	NESE	Morton	2190	1133	2689	3221	3638	3714	3735	3951
7020	137	88	5	SENE	Grant	2342	1500	2927	3504	3909	4010	4045	4260
4626	138	62	24	SENW	Stutsman	1437	299	392	810	1114	1160	1188	1312
7010	138	78	31	NENE	Burleigh	1752	n/a	1373	1972	2342	2395	2408	2615
8158	138	82	6	SWSE	Morton	1792	n/a	n/a	2455	2810	absent	undiffer	3082
5019	138	82	21	NWNE	Morton	1896	662	1961	2605	2900	2990	3010	3170
5379	138	83	5	NWNE	Morton	1980	850	2140	2732	3088	absent	undiffer	3365
7770	138	85	6	NWSW	Morton	2076	n/a	2590	3142	3465	absent	undiffer	3765
7691	138	85	19	SENW	Morton	2094	n/a	2520	3052	3480	3545	3558	3785
7937	138	86	19	NENE	Morton	1965	n/a	2500	3100	3477	3550	3570	3768
5016	138	86	36	SWSE	Morton	1930	850	2400	2970	3321	3385	3400	3633
9135	138	91	28	SENE	Stark	2361	n/a	3230	3827	4255	4349	4365	4600
672	139	67	12	NWNW	Stutsman	1867	430	994	1485	1798	1858	1892	2012
670	139	67	24	SESW	Stutsman	1874	453	n/a	1476	1798	1853	1885	2006
644	139	68	5	SESE	Stutsman	1945	435	1165	1649	1955	2008	2024	2168
669	139	68	35	SESW	Stutsman	1880	n/a	1063	1535	1860	1918	1950	2080
9324	139	76	4	NENE	Burleigh	1931	n/a	n/a	2031	2392	2451	2461	2648
6264	139	76	9	NENE	Burleigh	1938	n/a	1480	2025	2390	2450	2462	2660
4208	139	76	20	SESE	Burleigh	1938	512	1540	2045	2408	2468	2480	2690
723	139	76	36	NENE	Burleigh	1880	n/a	1392	1920	2290	2378	2391	2542
2185	139	82	11	SWNE	Morton	1861	825	1988	2568	2938	3026	3056	3223
133	139	86	30	SWSW	Morton	2204	1180	2726	3322	3734	3798	3808	4057
10386	139	90	20	NENE	Morton	2483	n/a	3318	3906	4322	4382	4398	4632
4640	140	59	9	SESW	Barnes	1440	n/a	n/a	755	1055	1104	1157	1260
406	140	65	20	NENE	Stutsman	1576	n/a	658	1155	1455	1522	1568	1690

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
370	140	65	21	NWNW	Stutsman	1573	n/a	614	1148	1450	1512	1558	1680
671	140	67	12	NWSW	Stutsman	1900	485	1044	1535	1834	1890	1927	2048
155	140	75	9	NENE	Burleigh	1912	475	1422	1975	2345	2402	2409	2592
6927	140	76	1	SESW	Burleigh	1952	n/a	1552	2055	2426	2472	2480	2678
6254	140	76	10	NWSW	Burleigh	1889	440	1480	2020	2380	2441	2450	2645
6911	140	76	11	NWNE	Burleigh	1918	560	1530	2040	2407	2461	2467	2660
6948	140	76	12	NWSW	Burleigh	1896	n/a	1485	2005	2370	2430	2439	2628
6902	140	76	13	SESE	Burleigh	1912	n/a	1468	2012	2378	2437	2445	2633
4201	140	76	36	NWNE	Burleigh	1875	n/a	1433	1955	2325	2411	2413	2582
174	140	77	3	NWNW	Burleigh	1981	n/a	1682	2215	2588	2648	2657	2850
19	140	77	6	SWSW	Burleigh	1909	n/a	1630	2168	2534	absent	undiffer	2805
1409	140	77	11	NWSE	Burleigh	2019	705	1670	2212	2587	2650	2657	2850
772	140	79	23	NWNW	Burleigh	2007	808	1803	2370	2737	absent	undiffer	3006
4593	140	80	7	SESW	Burleigh	1911	859	1813	2488	2851	2917	2923	n\a
4582	140	80	17	NWSW	Burleigh	1890	675	1780	2450	2821	2912	2920	n\a
4592	140	80	18	SWSW	Burleigh	1922	690	1800	2455	2820	2888	2930	n\a
4685	140	80	19	SWSW	Burleigh	1865	689	1755	2425	2795	2887	2920	3072
4581	140	81	12	NWNE	Burleigh	2006	930	1915	2585	2953	3039	3070	n\a
8553	140	82	17	SENW	Morton	1994	n/a	2295	2835	3181	3245	3272	3465
5017	140	86	36	NWSW	Morton	2204	n/a	2762	3350	3662	3725	3735	3970
7340	140	88	26	NWSE	Morton	2230	n/a	2940	3525	3928	4005	4062	4270
7818	140	89	5	NESE	Morton	2284	n/a	3260	3805	4220	4290	4303	4540
4678	141	61	30	NWSE	Barnes	1472	n/a	430	894	1196	1247	1293	1405
4548	141	65	28	SWSW	Stutsman	1570	n/a	705	1163	1435	1495	1555	n\a
40	141	67	11	NWNW	Stutsman	1870	411	998	1555	1840	1910	1930	2055
750	141	69	14	NWSE	Stutsman	1893	450	1205	1695	1990	2040	2072	2203
24	141	73	36	SENE	Kidder	1968	425	1458	1923	2272	2335	2372	2503
6253	141	75	5	SWSW	Burleigh	2075	n/a	1733	2211	2575	2629	2637	2830
1375	141	75	15	SESW	Burleigh	2073	555	1548	2154	2515	2572	2582	2772
6690	141	75	19	SESE	Burleigh	2001	640	1602	2110	2477	2532	2541	2730
6889	141	75	33	NENW	Burleigh	2010	630	1568	2105	2470	2530	2545	2728
4199	141	76	11	NESE	Burleigh	2004	695	1598	2156	2522	2579	2590	2780
8970	141	76	17	SWSW	Burleigh	1865	n/a	1535	2090	2455	2512	2523	2720
4580	141	80	26	NENE	Burleigh	2009	975	1910	2548	2910	2963	2976	n\a
4389	141	80	33	SWNE	Burleigh	2126	885	2185	2700	3072	3141	3152	3352
95	141	81	3	SESW	Oliver	1924	968	2138	2660	3037	3103	3134	3330
9867	141	81	6	NWNW	Oliver	1925	n/a	2251	2783	3128	3188	3210	3398
8144	141	82	15	SESE	Oliver	1973	n/a	2308	2835	3180	3245	3270	3460
2183	141	85	34	NWNW	Oliver	2173	1400	2758	3300	3717	3780	3789	4004
4660	142	60	25	NWSE	Barnes	1428	n/a	n/a	770	1048	1092	1156	1258
120	142	63	21	SENW	Stutsman	1493	n/a	n/a	972	1265	1312	1370	1455
134	142	65	15	SWNE	Stutsman	1552	n/a	805	1155	1451	1485	1541	1664
748	142	74	32	NWNE	Kidder	1848	445	1320	1910	2270	2327	2334	2515
4249	142	75	27	NESW	Burleigh	1878	545	1385	1985	2350	2395	2400	2590
6726	142	76	11	SESW	Burleigh	1913	640	1480	2080	2440	2491	2497	2695
6255	142	76	28	NENW	Burleigh	1987	740	1600	2193	2558	2620	2626	2812
765	142	76	31	SWSW	Burleigh	2027	715	1745	2267	2638	2695	2702	2893
4941	142	84	7	NESW	Oliver	2138	1380	2745	3301	3690	3755	3768	3997
5369	142	85	14	NESE	Oliver	2195	1410	2815	3330	3710	3760	3800	n\a
5099	142	85	24	NENW	Oliver	2254	1580	2910	3410	3792	3852	3870	4103
21	142	89	28	NWNE	Mercer	2287	1640	3390	3940	4350	4428	4448	4675
8675	142	90	6	NENW	Mercer	2085	n/a	3510	4050	4460	4545	4572	4824
4689	143	58	29	SWNE	Barnes	1422	n/a	n/a	720	991	1034	1109	1210
401	143	61	23	SESW	Barnes	1473	n/a	542	875	1155	1210	1290	1365
9776	143	63	8	SWSE	Stutsman	1545	n/a	740	1060	1351	1400	1449	1550
4555	143	63	35	NWNE	Stutsman	1543	n/a	708	1029	1315	1368	1420	n\a
602	143	69	4	NWNW	Stutsman	1947	662	1300	1795	2090	2145	2185	2304
230	143	71	16	NESE	Kidder	1889	310	1341	1765	2098	2168	2202	2320
4628	143	79	6	NENE	Burleigh	1977	878	1927	2560	2940	absent	undiffer	3212
4938	143	83	10	SWNW	Oliver	1951	1080	2386	2940	3315	3372	3380	3605
9281	143	84	9	SENW	Oliver	1999	n/a	2570	3080	3480	3548	3570	3780
4939	143	84	33	NENE	Oliver	2139	1398	2695	3274	3657	3710	3718	3951
4942	143	86	34	SENE	Oliver	2217	1545	2948	3548	3940	4012	4049	4273

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
2826	143	90	1	SESW	Mercer	2201	1632	3550	4100	4592	4678	4697	4938
8863	143	91	13	SESE	Dunn	2227	2012	3600	4162	4621	4703	4730	4977
14014	144	58	18	NESW	Griggs	1423	n/a	317	762	981	1011	1082	1180
14015	144	58	24	SWSE	Steele	1454	n/a	330	788	1011	1050	1150	1210
4713	144	60	15	NWSE	Griggs	1447	n/a	n/a	805	1060	1121	1200	1289
4556	144	65	24	NWNW	Stutsman	1535	n/a	n/a	1125	1410	1468	1518	n\a
701	144	75	36	NENE	Burleigh	2023	600	1500	2132	2459	absent	undiffer	2715
763	144	77	14	SESE	Burleigh	1947	638	1628	2232	2598	absent	undiffer	2855
4811	144	81	6	NWNW	McLean	1912	955	2250	2800	3112	3162	3171	3382
8720	144	81	34	NENE	McLean	1815	1055	1972	2480	2856	2950	2980	3143
4823	144	85	34	NWNW	Mercer	1958	1248	2706	3210	3595	3658	3676	3895
377	144	88	10	SWSW	Mercer	2059	1555	3150	3693	4070	4142	4158	4412
4808	144	89	11	NWSE	Mercer	1968	1465	3188	3718	4040	4130	4168	4395
8798	144	90	6	NESE	Mercer	2211	n/a	3625	4212	4643	4730	4782	5015
4706	144	90	17	NWNE	Mercer	2043	1910	3478	4033	4460	4551	4617	4830
7616	144	90	29	SWNW	Mercer	2080	n/a	3460	4018	4454	4542	4592	4813
14017	145	57	26	SWNE	Steele	1485	n/a	222	742	960	992	1100	1180
14018	145	58	29	SENE	Griggs	1416	n/a	n/a	784	985	1032	1098	1200
295	145	62	26	SWNE	Foster	1496	n/a	505	933	1208	1244	1321	1405
334	145	64	24	NENE	Foster	1547	n/a	580	1100	1389	1435	1490	1578
661	145	66	17	SESE	Foster	1599	n/a	740	1212	1545	1595	1620	1731
652	145	67	20	SESW	Foster	1659	n/a	900	1355	1685	1730	1770	1890
635	145	68	30	NENE	Wells	1785	350	955	1580	1865	1912	1960	2070
11599	145	70	28	SENE	Wells	1857	n/a	1217	1750	2034	absent	undiffer	2257
384	145	71	13	NWNE	Wells	1891	430	1305	1785	2108	2160	2170	2325
385	145	72	26	SESE	Wells	1914	640	1413	1876	2206	absent	undiffer	2415
425	145	72	32	SESE	Wells	2060	639	1608	2060	2375	2428	2438	2594
4252	145	73	28	SWNE	Wells	1998	580	1590	2056	2380	2430	2440	2630
1605	145	75	18	NENW	Sheridan	2011	665	1780	2220	2558	2609	2630	2790
4814	145	80	21	NWNW	McLean	1944	850	2192	2670	3062	absent	undiffer	3330
4815	145	81	8	NENE	McLean	2013	1321	2340	2948	3231	3282	3305	3518
4810	145	82	22	SWSW	McLean	1875	918	1950	2308	3199	3251	3270	3472
4812	145	83	28	NESE	McLean	2008	1400	2620	3080	3465	3520	3541	3755
4824	145	84	29	NENE	Mercer	1699	1540	2380	2888	3268	3328	3350	3570
4796	145	85	17	SWSW	Mercer	1948	1682	2790	3303	3680	3750	3773	4005
4795	145	86	31	SESE	Mercer	1854	1610	2800	3333	3700	3770	3800	4030
4798	145	87	15	NWSW	Mercer	1924	1505	2950	3480	3840	3915	3930	4160
4177	145	88	17	NESW	Mercer	2203	1758	3370	3953	4332	4405	4422	4680
5030	145	89	9	SESE	Mercer	2220	1830	3550	4130	4575	4657	4680	4936
4711	145	89	27	NWSW	Mercer	2100	1815	3373	3950	4388	4470	4498	4760
8712	145	90	29	SWSW	Mercer	2167	n/a	3680	4253	4674	4758	4790	5030
14019	146	56	32	SWSE	Steele	1380	n/a	n/a	592	815	847	969	1050
14020	146	57	9	SWSW	Steele	1476	n/a	342	727	940	982	1083	n\a
14021	146	57	11		Steele	1538	n/a	372	809	1035	1061	1174	n\a
14022	146	57	30	SESE	Steele	1454	n/a	355	770	970	1008	1092	1180
14023	146	58	16	NESW	Griggs	1432	n/a	326	770	965	1010	1115	1179
14024	146	59	23		Griggs	1427	n/a	340	822	1019	1065	1113	1209
4720	146	60	10	NESE	Griggs	1472	n/a	435	915	1128	1171	1236	1313
4719	146	61	5	NWSE	Griggs	1471	n/a	478	895	1163	1203	1285	1353
4557	146	61	35	SWNE	Griggs	1456	n/a	449	865	1137	1178	1260	n\a
287	146	63	13	NWNW	Foster	1518	n/a	593	1008	1295	1324	1385	1463
1105	146	65	8	SESW	Foster	1533	n/a	664	1160	1455	1502	1545	1648
403	146	66	15	NENE	Foster	1547	n/a	671	1186	1478	1526	1566	1678
1112	146	66	23	NENE	Foster	1536	n/a	660	1198	1500	1549	1579	1689
1126	146	67	10	NWNW	Foster	1589	n/a	763	1285	1578	absent	undiffer	1770
5392	146	67	12	SENW	Foster	1584	n/a	710	1256	1545	1590	1625	1741
1211	146	68	8	NENE	Wells	1608	321	865	1392	1684	absent	undiffer	1883
9899	146	69	25	NENW	Wells	1690	n/a	952	1490	1768	1825	1865	1980
4094	146	71	2	NENW	Wells	1762	n/a	1198	1695	1987	2045	2061	2182
207	146	73	27	SESE	Wells	1933	540	1444	1957	2280	absent	undiffer	2500
735	146	74	16	SWSW	Sheridan	1994	615	1650	2112	2444	2495	2509	2688
693	146	76	19	SWSW	Sheridan	1984	685	1774	2298	2647	2695	2728	2913
9343	146	76	29	NWNW	Sheridan	2007	n/a	1815	2310	2652	2700	2724	2905

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
1392	146	77	27	NENE	Sheridan	1954	735	1780	2300	2660	2710	2740	2922
8711	146	80	31	SESE	McLean	1900	n/a	2158	2740	3057	3110	3120	3330
432	146	81	2	SWSE	McLean	1957	897	2050	2712	3098	3149	3157	3373
22	146	81	10	SWNE	McLean	1995	936	2100	2790	3155	3212	3228	3430
4813	146	81	34	NENE	McLean	1932	865	2055	2735	3128	3180	3202	3410
1516	146	82	32	SESW	McLean	2022	1055	2500	2970	3356	3413	3429	3628
4797	146	86	32	NESE	Mercer	2186	1750	3145	3645	4000	4072	4110	4335
4537	146	90	21	SENW	Mercer	2223	1835	3602	4170	4589	4675	4707	4945
3492	146	90	25	SWSE	Mercer	2309	2010	3705	4280	4704	4787	4815	5052
14025	147	56	19	NESW	Steele	1480	n/a	252	729	960	993	1101	n\a
14026	147	56	35	SWSE	Steele	1310	n/a	n/a	515	745	767	880	958
14027	147	57	1	SWSE	Steele	1451	n/a	243	678	900	941	1053	1150
14028	147	57	7	SWSW	Steele	1480	n/a	394	798	1009	1051	1152	1215
14029	147	57	9	SENW	Steele	1496	n/a	364	776	1010	1042	1170	1155
14030	147	57	31	SWSW	Steele	1376	n/a	305	692	900	950	1020	1100
14031	147	57	35	NESW	Steele	1537	n/a	365	795	1017	1055	1179	1210
14032	147	58	3	SWNE	Griggs	1456	n/a	n/a	770	970	1015	1135	1180
14033	147	58	8	SWSW	Griggs	1317	n/a	n/a	660	853	900	966	1057
14034	147	58	14	SESW	Griggs	1337	n/a	290	668	871	916	1025	1076
14035	147	58	22	NWSE	Griggs	1304	n/a	n/a	626	825	873	990	1029
14036	147	58	30	NESW	Griggs	1414	n/a	335	776	968	1010	1071	1168
14037	147	59	15	NWNE	Griggs	1472	n/a	381	856	1035	1078	1173	1238
1208	147	64	2	SWNE	Foster	1503	n/a	627	1048	1330	1379	1393	1497
1227	147	64	25	NENE	Foster	1463	n/a	545	972	1250	1302	1327	1430
1205	147	67	28	NENE	Foster	1588	n/a	760	1268	1557	1604	1636	1755
689	147	71	31	NENE	Wells	1702	280	1159	1672	1965	absent	undiffer	2168
1384	147	73	16	SWSW	Wells	1941	565	1423	1990	2312	2355	2370	2530
684	147	75	1	NENE	Sheridan	1849	518	1454	2003	2325	2373	2391	2548
5261	147	80	11	SWNE	McLean	1880	818	2065	2585	2923	2981	3005	3200
13330	147	97	19	SWNW	Dunn	2258	n/a	3987	4488	4972	5108	5120	5353
14039	148	56	13	NENE	Steele	1253	n/a	n/a	415	679	708	778	877
14040	148	57	12	SESE	Steele	1477	n/a	282	718	950	997	1090	1191
14041	148	57	17	SESE	Steele	1530	n/a	352	779	1000	1037	1140	n\a
14042	148	57	26	SWNW	Steele	1487	n/a	300	723	960	992	1060	1080
14043	148	58	28		Griggs	1467	n/a	388	802	1018	1052	1155	1210
14044	148	59	21	NWSE	Griggs	1449	n/a	325	797	975	1020	1104	1179
14045	148	60	5	NWSE	Griggs	1457	n/a	408	889	1071	1111	1165	1256
1274	148	62	9	SESE	Eddy	1584	n/a	615	1034	1298	1340	1382	1478
7271	148	65	9	NWSW	Eddy	1530	n/a	691	1149	1417	1480	1494	1605
1197	148	67	35	SWNW	Eddy	1557	n/a	720	1242	1532	1569	1585	1715
11653	148	70	35	NWNE	Wells	1609	n/a	940	1476	1752	absent	undiffer	1950
609	148	71	14	SWSE	Wells	1612	n/a	1012	1556	1830	absent	undiffer	2025
4096	148	73	10	NESE	Wells	1640	n/a	n/a	1665	1979	2028	2042	2198
336	148	73	13	SENW	Wells	1639	n/a	1155	1635	1965	2009	2015	2170
5112	148	73	16	SESE	Wells	1633	n/a	n/a	1651	1974	absent	undiffer	2185
3728	148	73	30	NENE	Wells	1827	507	1360	1875	2197	2249	2265	2410
3754	148	73	34	SWNE	Wells	1673	n/a	1174	1680	1995	2054	2081	2220
337	148	74	22	NESE	Sheridan	1891	514	1465	2005	2310	2360	2376	2532
665	148	76	15	NENE	Sheridan	1792	420	1480	2030	2363	2408	2422	2590
9923	148	77	20	NENE	Sheridan	2117	1270	1958	2508	2842	2905	2920	3095
5400	148	80	25	NWSE	McLean	1923	800	2070	2582	2927	2988	3002	3200
10199	148	87	12	NENE	McLean	2030	1890	2990	3525	3890	3965	3982	4205
8802	148	87	20	NWNE	McLean	2007	n/a	3080	3620	3980	4059	4078	4321
8060	148	89	7	SWNE	McLean	2109	n/a	3578	4110	4497	4590	4608	4835
5352	148	89	30	SENW	McLean	2058	1820	3430	4004	4408	4498	4518	4768
4375	148	90	1	NWNE	McLean	2064	1895	3487	4031	4430	4520	4542	4792
9941	148	90	12	NESE	McLean	2072	1930	3533	4071	4472	4568	4586	4818
14046	149	56	6		Grand For	1455	n/a	195	642	873	910	998	1150
14047	149	56	8	SWSE	Grand For	1453	n/a	n/a	646	895	925	962	1000
14048	149	56	13	SWNW	Grand For	1347	n/a	n/a	530	785	833	885	998
14049	149	56	26	SWSW	Grand For	1389	n/a	110	582	831	868	937	1015
14050	149	57	6	SESE	Nelson	1508	n/a	n/a	753	973	1012	1142	1220
14051	149	57	13	NESW	Nelson	1485	n/a	220	677	910	941	1048	1115

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
14052	149	57	25	NWNE	Nelson	1508	n/a	343	705	932	969	1022	1141
14054	149	58	10		Nelson	1528	n/a	400	810	1008	1050	1135	1200
14055	149	59	4	NWNE	Nelson	1475	n/a	367	840	1018	1053	1130	1202
4715	149	59	15	NWSE	Nelson	1359	n/a	257	740	928	970	1025	1113
14056	149	59	27	SWSW	Nelson	1472	n/a	371	861	1049	1095	1162	1249
4750	149	61	23	SWNE	Nelson	1518	n/a	498	915	1175	1212	1251	1351
5102	149	61	33	NENE	Nelson	1543	n/a	515	941	1200	1240	1271	1370
1198	149	67	33	NESE	Eddy	1559	n/a	770	1260	1550	absent	undiffer	1730
11654	149	70	24	NWNW	Wells	1620	n/a	945	1499	1762	absent	undiffer	1958
5106	149	71	4	SWNE	Wells	1624	n/a	1046	1550	1829	absent	undiffer	2020
5125	149	71	35	SESE	Wells	1621	n/a	1028	1587	1865	1912	1923	2061
3296	149	73	22	NWNE	Wells	1622	n/a	1125	1640	1970	2010	2026	2175
8993	149	80	26	SESW	McLean	1995	n/a	n/a	2652	2995	3051	3080	3280
8696	149	83	1	SESE	McLean	2054	1150	2500	2999	3380	3445	3463	3675
5126	149	86	16	NWSW	McLean	2227	1605	3157	3710	4050	4129	4152	4375
10409	149	86	34	NESE	McLean	2099	1900	3000	3552	3917	3992	4011	4243
13498	149	89	9	SESW	McLean	1898	n/a	3253	3787	4183	absent	undiffer	4508
13542	149	89	16	SENE	McLean	1957	n/a	3313	3852	4252	absent	undiffer	4577
14058	150	57	27	NWNW	Nelson	1512	n/a	351	685	960	1003	1029	1098
14059	150	58	5	NWNW	Nelson	1545	n/a	443	873	1070	1111	1140	1240
14060	150	58	10	NWSE	Nelson	1522	n/a	423	825	1029	1070	1155	n\a
14061	150	59	24	NWNE	Nelson	1491	n/a	400	830	1020	1058	1128	1198
768	150	65	8	NENE	Eddy	1561	n/a	741	1130	1405	1450	1458	1578
437	150	67	16	NWNW	Eddy	1478	n/a	681	1165	1437	absent	undiffer	1615
11655	150	68	7	NESW	Wells	1576	n/a	815	1314	1590	absent	undiffer	1773
642	150	70	32	NWNE	Wells	1599	348	1013	1510	1793	absent	undiffer	1970
5092	150	71	34	NENE	Wells	1615	n/a	1023	1561	1827	1886	1900	2028
5083	150	74	1	NENW	Sheridan	1740	400	1355	1821	2110	2160	2179	2319
1581	150	74	36	NWNE	Sheridan	1624	341	1229	1708	2010	2055	2072	2222
3076	150	79	14	SENW	McLean	2089	1000	2180	2673	3010	3068	3088	3281
3089	150	80	14	NWNW	McLean	2006	1028	2205	2687	3030	3092	3162	3325
49	150	80	28	SWSW	McLean	2100	n/a	2300	2805	3136	3200	3218	3417
8807	150	82	16	SENW	McLean	2121	n/a	2522	3012	3389	3451	3463	3680
8310	150	86	27	SESE	McLean	2162	1702	3070	3605	3950	4032	4060	4280
8373	150	88	9	NWNW	McLean	2094	n/a	3304	3740	4205	absent	undiffer	4533
5826	150	88	29	SESE	McLean	1999	1615	3235	3777	4140	4238	4245	4478
6766	150	89	12	NWNW	McLean	2019	n/a	3283	3820	4203	4292	4298	4550
9512	150	89	25	NENW	McLean	1982	1588	3298	3798	4207	4300	4305	4540
7783	150	90	1	SENW	McLean	2212	n/a	3734	4250	4643	4737	4745	4980
14098	151	57	29	NENE	Nelson	1496	n/a	370	697	930	950	970	1050
14062	151	57	34	NWSW	Nelson	1505	n/a	380	717	882	921	948	990
14063	151	58	10	NWSE	Nelson	1497	n/a	390	770	977	1012	1101	1155
14064	151	58	12	NWSE	Nelson	1531	n/a	412	796	1022	1058	1112	1158
14065	151	59	28	NENE	Nelson	1501	n/a	420	852	1038	1076	1110	1205
4785	151	60	6	NENE	Nelson	1496	n/a	462	865	1115	1155	1217	1290
4664	151	61	32	NWSW	Nelson	1473	n/a	458	875	1135	1179	1249	1322
2537	151	67	10	SESW	Benson	1543	n/a	748	1177	1450	1501	1538	1615
651	151	69	21	NESE	Benson	1510	n/a	765	1300	1568	absent	undiffer	1750
663	151	70	10	NENW	Benson	1560	n/a	885	1415	1670	1724	1730	1852
4108	151	71	26	SESE	Benson	1574	305	1100	1550	1782	1848	1865	1980
6628	151	73	18	SESW	Pierce	1806	n/a	1430	1854	2153	2192	2210	2350
5205	151	74	2	NENW	Pierce	1671	n/a	1315	1740	2037	2090	2102	2245
3877	151	74	15	SENW	Pierce	1577	750	1193	1655	1950	2010	2020	2160
8803	151	80	22	NENE	McHenry	1915	n/a	n/a	2555	2897	2960	2980	3170
5401	151	81	19	SWSE	Ward	2146	1118	2526	2988	3335	3400	3431	3617
5096	151	86	23	SWSW	Ward	2150	1620	3027	3560	3900	3980	3991	4222
8177	151	87	18	SESE	Ward	2146	1672	3200	3625	4093	4181	4199	4453
5481	151	88	8	NESE	Mountrail	2138	1710	3319	3855	4230	4330	4365	4605
11086	151	88	14	NWNE	Mountrail	2112	n/a	3222	3744	4111	4195	4212	4445
5353	151	88	18	SENW	Mountrail	2126	1695	3350	3860	4260	4357	4370	4610
5731	151	88	20	SENW	Mountrail	2147	1725	3498	3896	4328	4412	4442	4670
5529	151	88	21	SESW	Mountrail	2145	1722	3362	3805	4262	4380	4390	4645
5273	151	88	26	NESW	Mountrail	2167	1705	3322	3868	4221	4304	4330	4605

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
12199	151	88	28	NESW	Mountrail	2135	1695	3352	3860	4259	4355	4395	4615
12642	151	89	23	NWSE	Mountrail	2108	1812	3375	3883	4260	4348	4355	4598
12770	151	89	25	NWNW	Mountrail	2103	1810	3372	3887	4278	4371	4375	4618
8213	151	89	27	NWSE	Mountrail	2138	1848	3453	3990	4328	4400	4430	4663
8447	151	89	34	NWNE	Mountrail	2139	1815	3445	3950	4332	4420	4431	4663
4392	151	90	13	NENW	Mountrail	2115	1882	3545	4100	4422	4512	4533	4760
4386	151	90	28	SESE	Mountrail	2216	1982	3680	4193	4579	4678	4690	4925
5257	151	90	34	NWSW	Mountrail	2223	n/a	3710	4230	4622	4720	4730	4963
8559	151	90	36	SWSE	Mountrail	2198	n/a	3688	4186	4552	4645	4655	4895
4784	152	59	16	NWNW	Nelson	1527	n/a	452	850	1110	1149	1180	1250
1934	152	60	5	SESE	Nelson	1521	n/a	465	872	1085	1173	1212	1283
4714	152	60	36	NESW	Nelson	1407	n/a	439	843	1075	1142	1172	1251
4755	152	62	17	SESE	Ramsey	1506	n/a	546	960	1220	1260	1309	1389
6627	152	62	24	NWNE	Ramsey	1500	n/a	509	920	1180	1220	1258	1335
7953	152	62	25	SWSE	Ramsey	1473	n/a	580	910	1180	1220	1240	1325
660	152	68	16	SENE	Benson	1609	n/a	833	1335	1588	absent	undiffer	1755
5082	152	69	8	NWNW	Benson	1613	n/a	920	1390	1652	absent	undiffer	1828
654	152	69	21	SENE	Benson	1589	n/a	910	1385	1627	absent	undiffer	1804
2209	152	72	33	SENE	Pierce	1624	n/a	1093	1580	1885	absent	undiffer	2074
567	152	73	6	NENE	Pierce	1531	n/a	1123	1566	1862	1912	1920	2055
5576	152	73	34	SWSW	Pierce	1579	n/a	1117	1581	1881	1920	1930	2070
4099	152	73	36	SWNE	Pierce	1593	n/a	n/a	1565	1865	1905	1918	2058
5307	152	74	16	NENE	Pierce	1548	n/a	1160	1608	1898	1950	1968	2103
3920	152	74	23	SESE	Pierce	1605	749	1203	1650	1938	1995	2010	2142
8801	152	80	15	NWNW	McHenry	1678	688	1886	2318	2662	2721	2744	2940
588	152	82	33	SWSE	Ward	2087	1126	2522	2998	3330	absent	undiffer	3618
3080	152	83	13	SESE	Ward	2110	1210	2580	3050	3382	3445	3456	3655
7554	152	85	7	SWNW	Ward	2122	1662	3000	3451	3859	3938	3955	4180
5578	152	86	1	NWSW	Ward	2121	1588	2968	3445	3820	3905	3925	4150
5080	152	86	2	NWSW	Ward	2141	1487	2982	3475	3848	3940	3955	4190
5219	152	86	3	SWNE	Ward	2133	1450	2983	3468	3842	3920	3941	4189
11606	152	86	6	NWSE	Ward	2078	1540	3028	3532	3936	4023	4050	4261
9036	152	86	10	NWNW	Ward	2110	1595	2983	3472	3853	3935	3950	4154
5105	152	86	28	NWNW	Ward	2120	1632	3025	3558	3970	4059	4081	4289
8009	152	87	3	SWSE	Ward	2108	1551	3050	3500	3962	4045	4062	4340
9429	152	87	19	SWNW	Ward	2086	1568	3115	3549	4020	4108	4132	4387
5313	152	87	28	SWNW	Ward	2092	1544	3185	3615	3993	4062	4080	4335
12264	152	87	29	SENW	Ward	2103	1620	3117	3630	4021	4103	4120	4362
12411	152	88	2	SWSW	Mountrail	2098	1480	3170	3700	4020	absent	undiffer	4455
12849	152	88	5	NESW	Mountrail	2087	1552	3198	3680	4080	4175	4200	4417
12799	152	88	8	NESE	Mountrail	2089	n/a	n/a	3753	4189	absent	undiffer	4525
12822	152	88	9	SWNW	Mountrail	2093	n/a	n/a	3738	4169	absent	undiffer	4490
12899	152	88	10	NESE	Mountrail	2077	n/a	n/a	3680	4060	absent	undiffer	4448
12602	152	88	11	NWSE	Mountrail	2073	1558	3170	3655	4065	4162	4190	4440
9557	152	88	12	SWSW	Mountrail	2079	1549	3110	3650	4010	absent	undiffer	4378
12236	152	88	13	NWSW	Mountrail	2105	1528	3153	3686	4040	absent	undiffer	4418
9548	152	88	14	SENE	Mountrail	2095	1520	3145	3685	4040	absent	undiffer	4412
12819	152	88	16	SWSW	Mountrail	2084	n/a	n/a	3749	4168	absent	undiffer	4490
12858	152	88	17	NENE	Mountrail	2084	n/a	n/a	3778	4202	absent	undiffer	4521
2779	152	88	19	SWNW	Mountrail	2086	1528	3248	3768	4185	4270	4280	4520
9498	152	88	23	NESE	Mountrail	2095	1458	3150	3690	4070	4160	4165	4432
10994	152	88	24	NWSE	Mountrail	2098	1435	3131	3665	4050	4143	4158	4415
9219	152	88	28	NESW	Mountrail	2113	1515	3242	3775	4142	4242	4248	4510
9142	152	88	33	NWNW	Mountrail	2112	1575	3250	3775	4155	4262	4268	4532
8071	152	90	3	NENW	Mountrail	1967	n/a	3340	3857	4232	4328	4345	4570
9055	152	90	35	NWSE	Mountrail	2001	n/a	3419	3918	4311	4422	4431	4662
4633	153	58	8	SWNW	Nelson	1519	n/a	396	769	1050	1090	1140	1180
4558	153	60	24	SENW	Nelson	1519	n/a	437	855	1087	1160	1191	n\a
4783	153	62	2	NESE	Ramsey	1503	n/a	520	937	1170	1238	1261	1339
408	153	63	1	SWSW	Ramsey	1489	n/a	550	948	1180	1243	1306	1366
407	153	63	13	NESW	Ramsey	1487	n/a	535	950	1175	1243	1312	1378
645	153	67	27	NENW	Benson	1492	n/a	675	1170	1415	absent	undiffer	1578
636	153	68	17	SENE	Benson	1642	n/a	950	1370	1618	absent	undiffer	1785

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
678	153	69	22	NWNE	Benson	1673	n/a	988	1448	1718	absent	undiffer	1882
5204	153	71	25	SENW	Benson	1627	n/a	994	1491	1753	absent	undiffer	1930
8856	153	73	18	NESE	Pierce	1571	n/a	1155	1585	1875	1933	1945	2085
5237	153	74	3	NWSW	Pierce	1582	420	1164	1644	1937	1995	2005	2150
3879	153	74	11	SWSE	Pierce	1560	n/a	1168	1590	1880	1935	1950	2090
3892	153	74	21	NWSW	Pierce	1610	n/a	1231	1675	1968	2021	2040	2175
2505	153	75	5	NWNW	McHenry	1552	220	1214	1706	1997	2052	2061	2198
583	153	75	27	SENW	McHenry	1548	255	1241	1690	1987	absent	undiffer	2180
1697	153	76	4	SESW	McHenry	1551	335	1260	1778	2074	2126	2138	2280
9853	153	77	10	NENW	McHenry	1568	n/a	1310	1905	2202	2256	2266	2415
61	153	77	17	NWSE	McHenry	1570	522	1485	1918	2224	absent	undiffer	2472
5344	153	80	14	NWNW	McHenry	1636	619	1818	2242	2587	2642	2667	2858
5519	153	82	15	SWNE	Ward	1797	850	2185	2645	2994	absent	undiffer	3290
3314	153	83	7	SWSE	Ward	2067	1338	2720	3235	3568	3632	3640	3850
6150	153	83	34	NESW	Ward	2172	1298	2712	3180	3500	3600	3609	3820
12797	153	84	2	SESW	Ward	2077	1272	2792	3264	3620	absent	undiffer	3920
12585	153	84	3	SWNE	Ward	2081	1210	2751	3225	3572	3635	3645	3882
5356	153	84	5	SESW	Ward	2099	1305	2815	3285	3665	3750	3758	3970
13528	153	84	11	SESE	Ward	2111	n/a	2812	3290	3649	3731	3734	3935
13528	153	84	11	SESE	Ward	2111	n/a	2812	3290	3649	3731	3734	3935
12523	153	84	11	SWSE	Ward	2113	1250	2850	3325	3673	3751	3758	3972
12703	153	84	14	NWNE	Ward	2139	1258	2858	3343	3679	absent	undiffer	3980
11249	153	84	15	NWSE	Ward	2138	1286	2862	3330	3686	3766	3772	3985
6540	153	84	30	NENE	Ward	2123	1660	3040	3500	3825	3902	3910	4117
105	153	85	2	SWNE	Ward	2175	1470	2990	3525	3840	3925	3940	4180
5098	153	85	7	SENW	Ward	2149	1412	3080	3508	3849	3923	3929	4110
5158	153	85	13	NENW	Ward	2117	1278	2834	3360	3700	3778	3785	4005
5198	153	85	26	NENW	Ward	2105	1389	2878	3366	3698	absent	undiffer	4002
6664	153	85	32	SENW	Ward	2134	1403	2975	3490	3836	3909	3920	4140
5903	153	86	8	NWNW	Ward	2083	1515	2980	3535	3895	absent	undiffer	4256
2051	153	86	28	SENE	Ward	2117	1448	3062	3593	3960	absent	undiffer	4275
8654	153	87	8	NWNE	Ward	2121	1558	3170	3720	4065	absent	undiffer	4392
13491	153	87	9	NWSE	Ward	2107	n/a	3130	3670	4040	absent	undiffer	4348
13491	153	87	9	NWSE	Ward	2107	n/a	3130	3670	4040	absent	undiffer	4348
6637	153	87	24	SESE	Ward	2098	1393	3030	3565	3953	absent	undiffer	4248
7708	153	87	27	SENW	Ward	2077	1370	3049	3582	3945	absent	undiffer	4310
12436	153	87	32	SWSW	Ward	2101	1500	3125	3661	4060	absent	undiffer	4419
6872	153	88	16	NESE	Mountrail	2108	n/a	n/a	3870	4239	4330	4350	4590
12588	153	88	25	SESE	Mountrail	2114	1549	3178	3743	4149	4240	4250	4486
12516	153	88	36	SENE	Mountrail	2114	1380	3178	3737	4134	4242	4250	4470
7471	153	89	10	NENW	Mountrail	1979	1560	3245	3740	4116	4205	4228	4470
246	154	63	36	NENE	Ramsey	1517	n/a	570	976	1208	1272	1317	1392
196	154	65	16	NENE	Ramsey	1487	n/a	647	1065	1335	absent	undiffer	1480
683	154	69	2	NENE	Benson	1767	n/a	1128	1547	1800	absent	undiffer	1960
632	154	70	31	NWSE	Benson	1637	n/a	975	1460	1720	absent	undiffer	1910
538	154	72	17	NESE	Pierce	1556	n/a	1145	1527	1805	1868	1873	1998
557	154	73	11	NWNW	Pierce	1555	370	1132	1535	1822	1885	1895	2022
4567	154	73	33	SWSW	Pierce	1503	295	1015	1483	1770	1815	1840	1970
361	154	74	22	SWNW	Pierce	1545	n/a	1100	1578	1875	absent	undiffer	2069
3878	154	75	15	NWNW	McHenry	1522	n/a	1160	1630	1930	1985	1990	2134
360	154	76	23	NWSW	McHenry	1554	n/a	1240	1733	2035	2090	2094	2235
1720	154	77	30	NENE	McHenry	1557	462	1478	1900	2205	2258	2270	2421
769	154	78	14	NWNW	McHenry	1481	355	1305	1870	2188	absent	undiffer	2405
3237	154	81	19	NENW	Ward	1566	576	1907	2356	2704	absent	undiffer	2968
11112	154	82	7	SESE	Ward	1755	905	2193	2698	3029	absent	undiffer	3308
4891	154	82	31	SWSE	Ward	1797	885	2230	2720	3063	absent	undiffer	3361
11002	154	82	33	NWNW	Ward	1758	802	2170	2620	2987	3061	3069	3290
2930	154	83	8	NWNW	Ward	1845	975	2435	2903	3223	3305	3319	3510
12241	154	84	5	SENW	Ward	1970	1241	2591	3060	3401	3478	3487	3695
13610	154	84	18	NESE	Ward	2062	n/a	2817	3298	3631	3707	3715	3920
4153	154	84	29	NENE	Ward	2115	1534	2930	3368	3700	3772	3791	4004
6653	154	84	32	SESW	Ward	2132	1520	2887	3370	3715	absent	undiffer	4010
12702	154	84	34	SESW	Ward	2045	1222	2720	3181	3518	3591	3600	3822

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
5389	154	85	6	NWNW	Ward	2219	1485	3098	3562	3918	3999	4020	4213
8475	154	85	12	SWSE	Ward	2084	1355	2820	3295	3645	3710	3728	3945
4987	154	85	18	SENW	Ward	2203	1500	3106	3554	3887	3971	3980	4218
8691	154	85	34	NWSW	Ward	2152	1495	2917	3410	3751	3830	3850	4060
5154	154	86	12	NESW	Ward	2195	1400	3101	3608	3950	4030	4051	4291
4223	154	86	22	SWSW	Ward	2121	1229	3050	3561	3928	absent	undiffer	4182
5207	154	86	35	SESE	Ward	2148	1450	3153	3574	3908	3980	4000	4243
12266	154	87	11	SWSW	Ward	2145	1451	3149	3681	4038	4125	4140	4380
7238	154	88	5	NWNE	Mountrail	2132	n/a	3270	3753	4107	4196	4218	4420
13503	154	88	35	NENE	Mountrail	2147	n/a	3208	3739	4118	4205	4208	4427
13503	154	88	35	NENE	Mountrail	2147	n/a	3208	3739	4118	4205	4208	4427
7918	154	89	29	SESW	Mountrail	2162	1800	3480	3972	4350	4448	4472	4683
13435	154	89	33	NWSW	Mountrail	2087	n/a	3365	3876	4247	4342	4366	4600
8069	154	90	12	SESE	Mountrail	2213	1850	3550	4031	4397	4497	4510	4718
5177	155	61	3	NENW	Ramsey	1557	n/a	n/a	1010	1245	1310	1389	1450
14067	155	61	12		Ramsey	1509	n/a	439	948	1132	absent	undiffer	1254
4559	155	61	27	SWSW	Ramsey	1516	n/a	487	890	1137	1177	1232	n\a
4771	155	64	2	NWNW	Ramsey	1468	n/a	565	980	1240	1275	1309	1380
4860	155	65	7	NWSW	Ramsey	1457	n/a	624	1037	1298	1378	1390	n\a
695	155	67	14	SWSE	Benson	1469	500	722	1121	1390	1445	1471	1537
2530	155	73	17	SENW	Pierce	1559	n/a	1100	1540	1830	1890	1895	2024
5978	155	74	13	NWNW	Pierce	1556	n/a	1039	1527	1825	absent	undiffer	2015
5765	155	74	25	NWSW	Pierce	1564	n/a	1123	1569	1865	1920	1940	2075
2504	155	76	31	NWNW	McHenry	1517	n/a	1238	1733	2035	absent	undiffer	2230
1631	155	77	19	NESE	McHenry	1559	425	1445	1870	2172	2221	2225	2370
2489	155	77	27	NENW	McHenry	1491	200	1315	1765	2074	2122	2130	2280
8307	155	77	31	NENW	McHenry	1516	n/a	1286	1855	2164	2212	2215	2365
1668	155	78	8	SWNE	McHenry	1521	n/a	1360	1895	2195	2250	2256	2410
6711	155	79	13	SENW	McHenry	1522	440	1425	1974	2275	2330	2339	2485
10741	155	79	29	SWNW	McHenry	1531	n/a	1597	2092	2363	2420	2435	2618
5531	155	81	21	SWSW	Ward	1607	549	1821	2255	2630	2690	2703	2903
8323	155	81	23	NWSE	Ward	1587	n/a	1762	2190	2560	2621	2632	2826
2929	155	82	6	SENW	Ward	1631	617	2031	2480	2825	2900	2910	3110
656	155	82	13	NWNE	Ward	1632	638	1938	2405	2698	2768	2775	2971
6100	155	82	25	SWSW	Ward	1659	640	2002	2420	2751	2819	2828	3018
5304	155	84	7	NENE	Ward	1885	1108	2530	3015	3320	3400	3418	3630
6725	155	84	8	NWNW	Ward	1884	1049	2505	2960	3328	3400	3410	3635
5723	155	84	9	NWNW	Ward	1858	1191	2452	2908	3270	3329	3347	3567
4155	155	84	10	NWSE	Ward	1818	1104	2452	2921	3240	3319	3330	3530
3824	155	85	6	NWNW	Ward	2030	1460	2890	3365	3682	3768	3788	4000
4799	155	85	7	NWNW	Ward	2045	1491	2920	3399	3710	3782	3810	4030
3039	155	85	11	NWNW	Ward	1944	1255	2668	3148	3450	3525	3541	3750
8412	155	85	12	NENE	Ward	1904	1175	2545	3015	3359	3440	3457	3670
6008	155	85	18	SWSW	Ward	2125	1530	2972	3476	3800	3875	3890	4115
6006	155	85	19	SWSE	Ward	2169	1585	3012	3502	3819	3896	3909	4132
5077	155	85	20	NWSE	Ward	2081	1352	2917	3366	3698	3770	3787	4000
8547	155	85	21	SESE	Ward	2047	1275	2828	3302	3640	3721	3730	3957
4159	155	85	22	SENE	Ward	1996	1167	2781	3282	3600	3662	3687	3910
4658	155	85	29	NWNW	Ward	2132	1441	2915	3455	3775	3859	3875	4080
8939	155	85	30	NWNE	Ward	2186	1510	3031	3500	3850	3934	3950	4170
11076	155	85	31	SWNE	Ward	2213	1520	3052	3533	3885	3968	3983	4200
6610	155	85	32	NWNW	Ward	2206	1472	3038	3510	3860	3926	3940	4160
5860	155	86	1	SWSW	Ward	2074	1398	2948	3440	3755	3840	3852	4058
10601	155	86	2	SENW	Ward	2073	n/a	2990	3450	3782	3861	3872	4115
6934	155	86	4	SESE	Ward	2186	1687	3180	3610	3940	4030	4045	4260
12860	155	86	8	NESE	Ward	2274	n/a	n/a	3708	4061	absent	undiffer	4361
13544	155	86	8	NWNE	Ward	2246	n/a	n/a	3683	4030	absent	undiffer	4330
5962	155	86	9	NWNW	Ward	2232	1699	3180	3655	4009	4093	4102	4348
11308	155	86	15	NWSW	Ward	2255	1690	3120	3648	3998	4086	4105	4320
5468	155	86	16	NWNE	Ward	2234	1668	3161	3635	3990	4081	4089	4328
10505	155	86	20	NESE	Ward	2261	1698	3220	3713	4070	4153	4170	4415
11808	155	86	21	NWNW	Ward	2267	1685	3220	3690	4043	4132	4147	4391
6459	155	86	22	NENW	Ward	2280	1633	3164	3647	3999	4086	4102	4344

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
4768	155	86	23	NENW	Ward	2255	1660	3150	3661	3980	4066	4082	4310
5058	155	86	24	NESW	Ward	2210	1658	3082	3550	3890	3977	3990	4210
10491	155	86	26	NESW	Ward	2240	1460	3125	3620	3975	4052	4068	4301
10725	155	86	27	SWSW	Ward	2183	1408	3102	3597	3950	4039	4049	4283
11669	155	86	30	NWSE	Ward	2160	1591	3129	3632	3994	4080	4101	4350
7711	155	86	31	SENE	Ward	2192	1550	3161	3670	4039	4116	4128	4380
5795	155	86	36	SWSE	Ward	2240	1430	3030	3550	3870	3930	3960	4232
7612	155	87	15	SESW	Ward	2219	n/a	3265	3705	4055	absent	undiffer	4390
8749	155	87	16	NWNE	Ward	2137	1555	3132	3647	3990	absent	undiffer	4340
6179	155	88	35	NWSW	Mountrail	2135	1452	3287	3723	4064	absent	undiffer	4412
7368	155	89	19	NWSE	Mountrail	2034	1649	3318	3812	4168	4265	4276	4482
2973	156	56	8	SWSE	Walsh	1186	n/a	n/a	274	475	523	531	586
2623	156	58	9	NENW	Walsh	1562	n/a	360	762	991	1027	1063	1110
14069	156	59	9	NWNW	Walsh	1565	n/a	391	831	996	1045	1055	1106
14070	156	60	20	SWSW	Ramsey	1515	n/a	430	911	1100	1138	1162	1229
14071	156	61	27	SWSW	Ramsey	1509	n/a	462	970	1142	1179	1208	1273
4914	156	61	32	NENE	Ramsey	1514	n/a	482	886	1137	1170	1233	1296
4745	156	62	14	NWSW	Ramsey	1511	n/a	517	926	1148	1213	1250	1313
692	156	67	2	NESW	Benson	1490	n/a	693	1096	1355	1398	1440	1498
616	156	68	5	NESW	Benson	1584	n/a	924	1270	1540	1598	1615	1689
601	156	69	23	NWNE	Benson	1547	n/a	946	1303	1571	absent	undiffer	1718
624	156	70	34	NWSE	Benson	1612	n/a	1047	1478	1717	absent	undiffer	1878
560	156	73	18	SWNW	Pierce	1528	n/a	1051	1507	1798	absent	undiffer	1980
5802	156	74	21	SWSE	Pierce	1575	n/a	1112	1550	1849	absent	undiffer	2039
5206	156	74	27	NENE	Pierce	1603	n/a	1140	1580	1880	absent	undiffer	2060
387	156	75	11	SENE	McHenry	1502	n/a	1055	1546	1838	1911	1920	2030
5022	156	76	1	NWNE	McHenry	1486	350	1136	1590	1902	1965	1995	2080
10513	156	76	8	NENE	McHenry	1465	n/a	1093	1577	1910	absent	undiffer	2095
358	156	76	34	SENE	McHenry	1502	n/a	1177	1648	1955	absent	undiffer	2150
4536	156	77	9	SWSE	McHenry	1513	n/a	1268	1722	2030	2072	2082	2225
2479	156	77	11	NENW	McHenry	1513	n/a	1241	1683	1997	2038	2046	2190
3270	156	77	19	SWSW	McHenry	1526	n/a	1321	1790	2095	2141	2150	2290
1354	156	77	26	NWNW	McHenry	1489	n/a	1229	1692	1995	2045	2052	2185
3175	156	78	12	NENE	McHenry	1563	n/a	1264	1800	2104	2162	2169	2310
3670	156	79	6	NWSW	McHenry	1509	n/a	1380	1926	2230	2286	2290	2460
6439	156	79	10	NENW	McHenry	1496	n/a	1355	1897	2197	2251	2254	2418
4148	156	79	11	SESE	McHenry	1493	n/a	1340	1885	2188	absent	undiffer	2409
10283	156	79	17	NWSW	McHenry	1509	n/a	1390	1925	2226	2272	2275	2450
4112	156	80	8	NWSE	McHenry	1526	n/a	1495	2045	2357	2412	2420	2592
10819	156	81	2	SWSW	Ward	1563	889	1727	2125	2466	2523	2527	2703
3124	156	81	3	NWSW	Ward	1566	930	1750	2140	2492	absent	undiffer	2740
6314	156	81	4	NWSE	Ward	1575	968	1812	2219	2522	absent	undiffer	2775
4923	156	81	5	NWNE	Ward	1573	n/a	1822	2170	2535	absent	undiffer	2808
5563	156	81	8	SESW	Ward	1580	500	1731	2198	2565	2631	2640	2833
5923	156	81	9	NESE	Ward	1579	550	1730	2208	2512	2573	2581	2776
2946	156	81	12	NWNE	Ward	1556	n/a	1615	2070	2418	absent	undiffer	2643
11055	156	81	19	NENW	Ward	1612	788	1819	2240	2595	2661	2668	2860
3501	156	81	23	SENW	Ward	1562	445	1720	2151	2450	2505	2516	2710
12412	156	82	1	NWSW	Ward	1613	785	1831	2248	2602	2670	2680	2872
5139	156	82	2	NENE	Ward	1573	750	1820	2262	2580	2645	2651	2860
4343	156	82	3	NWSW	Ward	1629	702	1936	2425	2680	2740	2751	2949
8211	156	82	4	NESW	Ward	1636	687	1910	2322	2688	2758	2765	2922
5300	156	82	5	SESE	Ward	1638	532	1960	2460	2710	2775	2787	2987
4117	156	82	14	NENE	Ward	1620	557	1931	2345	2644	2705	2718	2915
5149	156	82	15	SENW	Ward	1618	699	1930	2389	2690	2752	2762	2980
1138	156	82	19	SWNW	Ward	1636	750	2004	2478	2810	absent	undiffer	3112
4145	156	83	2	NWNW	Ward	1635	710	2010	2460	2758	2841	2856	3053
4805	156	83	22	NWNE	Ward	1678	700	2089	2645	2895	2971	2987	3200
126	156	83	33	SWSE	Ward	1772	1002	2261	2760	3059	3131	3141	3351
8541	156	84	4	NWNE	Ward	1770	809	2257	2698	3048	3127	3140	3347
4400	156	84	10	NWSE	Ward	1730	908	2204	2711	2998	3073	3088	3305
4990	156	84	22	NWSW	Ward	1788	1000	2306	2800	3136	3215	3233	3425
12742	156	84	31	NENE	Ward	1819	1029	2410	2880	3220	3297	3312	3520

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
3812	156	85	4	NWSW	Ward	1888	1157	2573	3050	3353	3436	3451	3654
3984	156	85	19	SWSW	Ward	1982	1352	2791	3280	3595	3681	3700	3901
11701	156	85	23	SENW	Ward	1881	1115	2501	2975	3309	3398	3405	3620
6073	156	86	5	SWNW	Ward	2066	1510	3021	3495	3829	3918	3924	4101
1438	156	86	6	NWSW	Ward	2104	1501	3110	3610	3910	absent	undiffer	4240
3125	156	86	11	SWNE	Ward	1990	1353	2817	3304	3609	3682	3697	3901
6223	156	86	15	NESW	Ward	2050	1562	2952	3410	3749	3831	3840	4050
8109	156	86	16	SESW	Ward	2074	1670	3070	3535	3870	3951	3968	4203
5368	156	86	17	SENW	Ward	2105	1650	3110	3598	3903	3990	4003	4235
8056	156	86	19	SWSE	Ward	2179	1715	3180	3650	3998	4083	4102	4335
6932	156	86	20	SWNE	Ward	2112	1670	3105	3570	3897	3989	4000	4232
10615	156	86	21	SENW	Ward	2082	1650	3070	3530	3856	3943	3958	4175
6012	156	86	22	SWSW	Ward	2078	1608	3015	3470	3813	3900	3917	4148
6043	156	86	27	NESW	Ward	2089	1500	3030	3505	3818	3902	3910	4122
5520	156	86	28	NWNW	Ward	2111	1735	3080	3545	3888	3975	3992	4200
7696	156	86	29	NWSW	Ward	2200	1640	3161	3640	3990	4071	4083	4311
8376	156	86	30	SESE	Ward	2199	1711	3172	3650	3981	4070	4084	4311
9094	156	86	33	NESW	Ward	2146	1540	3116	3600	3949	4037	4052	4261
4835	156	86	34	NENW	Ward	2098	1630	3030	3500	3842	3930	3934	4170
4639	156	86	35	SWSW	Ward	2081	1450	2989	3455	3790	3878	3890	4111
7042	156	87	12	SWSE	Ward	2146	1595	3140	3610	3957	absent	undiffer	4298
4216	156	87	36	NENE	Ward	2263	1760	3251	3770	4070	4155	4172	4399
3581	156	88	5	NWNW	Mountrail	2268	1750	3436	3913	4251	4347	4353	4598
9983	156	88	8	NENE	Mountrail	2292	n/a	3470	3915	4271	4355	4372	4594
1223	156	88	27	SWSE	Mountrail	2180	1850	3331	3825	4170	absent	undiffer	4503
9758	156	89	4	NENE	Mountrail	2212	n/a	3442	3875	4207	4307	4327	4542
14072	157	60	10	NENE	Ramsey	1542	n/a	390	850	1015	1043	1068	1120
14073	157	61	15	NESE	Ramsey	1511	n/a	451	938	1133	absent	undiffer	1230
2523	157	63	5	SESE	Ramsey	1501	n/a	565	963	1206	1247	1270	1320
4635	157	63	35	SENW	Ramsey	1517	n/a	560	945	1190	1230	1268	1325
14074	157	65	3	SWNE	Towner	1475	n/a	595	988	1252	1295	1305	n\a
14075	157	65	10	SESW	Towner	1960	n/a	586	973	1228	1267	1321	n\a
14076	157	65	11		Towner	1467	n/a	n/a	980	1238	1279	1310	n\a
14077	157	65	13		Towner	0	n/a	578	975	1240	1272	1302	n\a
194	157	65	17	SWSE	Towner	1499	n/a	597	992	1251	1285	1326	1395
14078	157	65	23		Towner	1462	n/a	590	980	1239	1278	1321	n\a
706	157	70	23	SESE	Pierce	1652	335	1067	1472	1720	absent	undiffer	1880
12055	157	71	16	NWNW	Pierce	1654	n/a	1135	1540	1767	absent	undiffer	1926
780	157	73	3	NWSW	Pierce	1486	n/a	990	1425	1698	absent	undiffer	1870
2728	157	74	22	NENW	Pierce	1480	n/a	1038	1505	1788	1860	1870	1965
1457	157	74	26	SENW	Pierce	1488	n/a	1020	1505	1757	absent	undiffer	1930
5081	157	74	30	SENW	Pierce	1489	n/a	1074	1545	1848	absent	undiffer	2020
2567	157	75	1	NWNE	McHenry	1486	n/a	1060	1515	1802	absent	undiffer	1989
2610	157	75	10	SWNE	McHenry	1490	n/a	1120	1570	1871	absent	undiffer	2052
2629	157	75	12	NWSE	McHenry	1488	n/a	1090	1550	1851	1920	1935	2025
1471	157	75	28	NENW	McHenry	1477	n/a	1140	1590	1888	absent	undiffer	2070
2312	157	76	3	NWSW	McHenry	1480	n/a	1195	1650	1933	1981	1983	2118
5279	157	76	34	NESW	McHenry	1476	n/a	1189	1635	1920	1971	1973	2120
2642	157	77	21	NENE	McHenry	1507	n/a	1268	1715	2017	2070	2073	2220
1674	157	77	34	NWSW	McHenry	1506	n/a	1250	1698	1990	absent	undiffer	2187
39	157	78	3	NESW	McHenry	1480	445	1400	1790	2095	2145	2148	2290
2011	157	78	5	NWSE	McHenry	1482	n/a	1400	1791	2095	2147	2152	2307
1986	157	78	23	SESW	McHenry	1513	n/a	1350	1820	2126	absent	undiffer	2334
3229	157	78	29	SENE	McHenry	1492	n/a	1320	1800	2100	2155	2163	2303
5240	157	78	31	SWNE	McHenry	1510	n/a	1364	1858	2167	2220	2230	2380
9045	157	79	4	NWSE	McHenry	1480	n/a	1320	1860	2160	2213	2218	2369
2402	157	79	10	NWSW	McHenry	1492	n/a	1327	1855	2161	2217	2222	2360
5136	157	79	12	SWSW	McHenry	1485	n/a	1291	1821	2120	2172	2177	2330
10917	157	79	14	SWSW	McHenry	1496	n/a	1334	1824	2143	2196	2201	2350
5983	157	79	15	SWSW	McHenry	1505	n/a	1362	1890	2196	2250	2255	2415
7568	157	79	20	NESE	McHenry	1499	n/a	1360	1902	2212	2263	2271	2430
3201	157	79	22	SESE	McHenry	1498	n/a	1340	1870	2172	2229	2238	2386
3759	157	79	23	SESE	McHenry	1490	n/a	1318	1850	2145	2199	2203	2342

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
3453	157	79	24	SWNE	McHenry	1485	n/a	1299	1845	2130	2187	2196	2337
2956	157	79	33	NENW	McHenry	1506	n/a	1395	1914	2218	absent	undiffer	2440
3107	157	79	35	SENE	McHenry	1498	n/a	1344	1878	2178	2230	2237	2395
5982	157	80	2	SWNE	McHenry	1506	n/a	1391	1939	2248	absent	undiffer	2465
5066	157	80	9	SWSE	McHenry	1512	445	1610	2034	2320	2380	2388	2550
3071	157	80	12	NENE	McHenry	1495	n/a	1385	1924	2232	2290	2300	2447
10553	157	80	13	NENW	McHenry	1508	n/a	n/a	1960	2282	2340	2350	2514
883	157	80	21	NESW	McHenry	1533	375	1663	2099	2355	2411	2417	2599
1632	157	80	24	SWNE	McHenry	1509	440	1408	1965	2265	2321	2331	2497
3189	157	80	31	NWNW	McHenry	1551	458	1710	2120	2440	absent	undiffer	2680
4021	157	81	5	SWSE	Ward	1548	521	1800	2209	2509	2572	2580	2758
12722	157	81	6	NENW	Ward	1577	505	1813	2200	2552	2618	2625	2800
3485	157	81	12	NWNW	Ward	1541	560	1688	2110	2400	absent	undiffer	2620
4372	157	81	14	SWSE	Ward	1550	415	1575	2145	2440	2497	2509	2680
11213	157	81	16	NWSW	Ward	1589	n/a	1774	2176	2496	2560	2568	2737
11868	157	81	21	SWSW	Ward	1582	n/a	1828	2210	2551	2617	2623	2806
4409	157	81	24	SENE	Ward	1535	n/a	1530	2073	2405	absent	undiffer	2658
5275	157	81	26	SWSE	Ward	1582	512	1770	2205	2450	absent	undiffer	2740
4209	157	81	27	SWSW	Ward	1582	552	1792	2325	2591	absent	undiffer	2840
3952	157	81	30	NWNE	Ward	1596	505	1838	2316	2578	absent	undiffer	2838
3795	157	82	1	SWNE	Ward	1559	616	1660	2247	2550	2612	2620	2805
2017	157	82	2	NWNW	Ward	1598	670	1909	2309	2611	2680	2687	2857
6404	157	82	15	SWNW	Ward	1595	500	1851	2265	2609	2680	2685	2871
6005	157	82	21	NESE	Ward	1624	565	1930	2373	2660	2727	2736	2930
5079	157	82	26	NWSE	Ward	1586	681	1803	2295	2590	2660	2670	2860
5236	157	82	33	SWSW	Ward	1655	608	1989	2419	2736	2790	2801	3000
5542	157	82	34	NWSW	Ward	1636	830	1918	2335	2682	absent	undiffer	2969
6871	157	82	35	SESE	Ward	1624	838	1870	2314	2650	2710	2719	2922
6486	157	82	36	NENE	Ward	1622	705	1872	2335	2640	2690	2699	2913
5539	157	83	1	NWNW	Ward	1631	745	1935	2363	2687	2761	2771	2961
7055	157	83	20	SENW	Ward	1730	725	2149	2575	2887	absent	undiffer	3181
6502	157	84	2	SWNW	Ward	1770	805	2250	2655	3010	3095	3112	3312
9293	157	84	18	NESE	Ward	1811	938	2371	2840	3161	3240	3252	3458
8840	157	84	19	NENE	Ward	1812	967	2382	2850	3175	3241	3253	3458
9499	157	84	20	SENW	Ward	1789	875	2310	2830	3158	3240	3250	3452
7910	157	84	26	NWNE	Ward	1787	n/a	2298	2737	3088	absent	undiffer	3386
6201	157	85	2	SENE	Ward	1789	970	2408	2857	3175	3258	3267	3460
11095	157	85	10	NWNW	Ward	1845	1112	2508	2973	3293	3376	3387	3587
4251	157	85	19	SESW	Ward	1943	1267	2720	3228	3510	3596	3611	3806
392	157	85	21	SWSW	Ward	1875	1240	2600	3075	3380	3462	3480	3680
6032	157	85	24	NWSW	Ward	1829	1068	2452	2945	3268	3340	3352	3550
5809	157	86	3	SENE	Ward	1887	1202	2690	3148	3460	3549	3556	3753
4630	157	86	5	NWNE	Ward	1975	1326	2881	3360	3648	3722	3740	3930
3837	157	86	7	SESE	Ward	2014	1485	2950	3415	3731	3810	3831	4025
10551	157	86	10	SWNW	Ward	1963	1305	2791	3253	3581	3669	3677	3878
12710	157	86	11	NENE	Ward	1900	1243	2652	3100	3410	3499	3512	3692
12694	157	86	18	SESE	Ward	2049	1452	3022	3510	3848	3940	3952	4151
9077	157	86	19	SWNW	Ward	2105	1563	3115	3580	3910	absent	undiffer	4245
8170	157	86	21	SENE	Ward	2004	1368	2885	3360	3690	absent	undiffer	4028
3552	157	86	23	SENE	Ward	1968	1333	2760	3247	3550	3638	3650	3840
10496	157	86	25	SESW	Ward	1979	1343	2780	3269	3598	absent	undiffer	3902
7710	157	86	28	SENE	Ward	2030	1414	2978	3440	3770	3860	3870	4100
8057	157	86	30	NWSE	Ward	2111	1555	3151	3620	3958	4030	4050	4262
7043	157	86	32	SWNW	Ward	2112	1576	3143	3615	3939	4027	4045	4279
6978	157	87	1	NWSW	Ward	2053	1432	3050	3515	3852	3939	3947	4160
11666	157	87	2	SWNW	Ward	2065	1550	3042	3545	3880	3951	3960	4200
11829	157	87	3	SWSW	Ward	2176	1565	3251	3705	4030	4120	4140	4365
3256	157	87	6	SWSE	Ward	2245	1630	3287	3756	4049	4130	4146	4376
10309	157	87	7	NESE	Ward	2264	1635	3320	3779	4078	4166	4186	4405
9150	157	87	9	SWNE	Ward	2213	1640	3295	3716	4043	4138	4157	4362
12721	157	87	11	NWNW	Ward	2116	1613	3150	3600	3929	absent	undiffer	4223
5707	157	87	12	SWNE	Ward	2050	1485	3041	3520	3860	3940	3951	4155
7960	157	87	13	SESE	Ward	2087	1388	3089	3555	3886	absent	undiffer	4215

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
4794	157	87	22	NWSE	Ward	2227	1555	3333	3790	4090	4200	4215	4415
13627	157	87	29	NENE	Ward	2288	n/a	n/a	3818	4157	absent	undiffer	4463
7646	157	87	36	NWSE	Ward	2197	1680	3255	3718	4062	absent	undiffer	4379
3673	157	88	12	NESE	Mountrail	2301	1686	3355	3800	4125	absent	undiffer	4418
11554	157	88	17	SENE	Mountrail	2319	1790	3430	3940	4268	4368	4370	4595
11872	157	88	29	NWNE	Mountrail	2378	1848	3553	4012	4341	4445	4447	4656
12274	157	88	30	SWSE	Mountrail	2273	1747	3448	3949	4272	4378	4387	4581
3575	157	89	3	NWNE	Mountrail	2289	1690	3520	3980	4277	4358	4380	4608
14079	158	60	25	NWNW	Ramsey	1572	n/a	425	871	1008	1040	1052	1115
14080	158	60	30	NWNW	Ramsey	1536	n/a	441	911	1068	1095	1105	1173
14081	158	61	20	SWSW	Ramsey	1541	n/a	530	975	1138	absent	undiffer	1232
2522	158	61	21	NENE	Ramsey	1549	n/a	474	885	1194	1240	1258	1300
2612	158	62	11	NENE	Ramsey	1561	n/a	552	905	1170	1210	1230	1279
383	158	62	17	NWNW	Ramsey	1556	n/a	525	1022	1255	1318	1337	1361
14082	158	62	24		Ramsey	1546	n/a	n/a	1017	1195	1233	1240	1303
20	158	62	29	SENE	Ramsey	1544	n/a	553	1022	1245	1306	1329	1395
411	158	63	11	SWSE	Ramsey	1557	n/a	530	1011	1245	1308	1331	1400
6372	158	66	11	NESE	Towner	1480	n/a	610	1000	1251	absent	undiffer	1390
227	158	66	31	SWSW	Towner	1465	280	646	1040	1300	absent	undiffer	1435
435	158	69	12	SENW	Pierce	1589	n/a	872	1280	1538	1582	1610	1692
716	158	70	3	NWNE	Pierce	1608	n/a	968	1393	1640	absent	undiffer	1778
12125	158	72	1	SENE	Pierce	1622	n/a	1115	1565	1790	absent	undiffer	1915
712	158	72	8	SWNW	Pierce	1642	n/a	1177	1572	1800	absent	undiffer	1960
12141	158	72	12	NENE	Pierce	1654	n/a	1130	1595	1812	absent	undiffer	1995
30	158	72	28	NENE	Pierce	1570	n/a	1090	1500	1720	absent	undiffer	1900
8880	158	73	15	SENE	Pierce	1543	479	1040	1518	1758	absent	undiffer	1928
274	158	74	19	NWSE	Pierce	1488	n/a	1038	1546	1790	absent	undiffer	1970
1462	158	75	5	SWSE	McHenry	1490	n/a	1062	1552	1842	absent	undiffer	2030
5281	158	75	16	SWSW	McHenry	1470	n/a	1065	1565	1841	absent	undiffer	2018
5391	158	75	22	NESW	McHenry	1475	n/a	1071	1562	1839	1910	1920	2010
6406	158	75	34	SWSE	McHenry	1483	n/a	1078	1545	1844	absent	undiffer	2023
1973	158	77	13	SESE	McHenry	1462	n/a	1155	1630	1908	absent	undiffer	2090
2076	158	77	15	NWNW	McHenry	1465	n/a	1215	1680	1961	1998	2015	2155
2765	158	77	19	NWNE	McHenry	1466	n/a	1271	1730	2010	2067	2070	2200
3994	158	77	23	SESE	McHenry	1469	n/a	1138	1650	1931	1986	1989	2120
2762	158	77	33	SESW	McHenry	1492	n/a	1210	1748	2035	absent	undiffer	2234
5283	158	77	34	NENE	McHenry	1477	n/a	1238	1671	1978	2045	2052	2160
2546	158	77	36	SWSW	McHenry	1479	n/a	1225	1683	1966	2014	2018	2155
1463	158	78	12	SENE	McHenry	1471	n/a	1290	1710	1995	absent	undiffer	2186
2652	158	78	13	SWNW	McHenry	1461	n/a	1280	1721	2015	2049	2065	2180
10282	158	79	6	SWNW	McHenry	1492	n/a	1332	1837	2162	2210	2218	2371
5076	158	79	7	NENE	McHenry	1480	n/a	1305	1842	2147	2196	2201	2358
11435	158	79	9	NENE	McHenry	1464	n/a	1280	1778	2089	2143	2150	2299
2867	158	80	4	NENE	McHenry	1493	n/a	1418	1941	2239	2299	2309	2455
2670	158	80	6	NENE	McHenry	1505	491	1610	2018	2290	2349	2360	2520
12553	158	80	6	SESW	McHenry	1507	479	1605	1995	2329	2375	2380	2553
12461	158	80	7	NENW	McHenry	1512	516	1617	2011	2331	2392	2405	2561
12828	158	80	8	NWNW	McHenry	1513	n/a	n/a	n/a	n/a	absent	undiffer	n\a
3428	158	80	9	SWNW	McHenry	1499	490	1510	1990	2263	2317	2327	2490
3214	158	80	10	NESW	McHenry	1496	n/a	1420	1947	2250	2306	2312	2470
7831	158	80	16	NWSE	McHenry	1506	415	1587	1935	2265	2322	2334	2485
5232	158	80	20	NWSW	McHenry	1500	430	1609	1977	2320	absent	undiffer	2524
3376	158	80	31	SWSW	McHenry	1527	531	1699	2099	2390	2448	2458	2620
3210	158	80	33	NESE	McHenry	1510	n/a	1440	1992	2302	2361	2371	2530
2747	158	81	2	SESW	Renville	1521	590	1525	2100	2385	2445	2456	2622
13529	158	81	4	NENW	Renville	1536	n/a	1705	2075	2407	absent	undiffer	2640
4666	158	81	8	SESE	Renville	1537	560	1780	2130	2451	2517	2525	2695
6380	158	81	12	NESW	Renville	1516	n/a	1678	2087	2372	2432	2438	2602
4127	158	81	13	NWSE	Renville	1515	541	1680	2113	2368	2428	2437	2600
4146	158	81	16	SWNE	Renville	1537	n/a	1590	2187	2438	2498	2509	2690
8884	158	81	17	SENW	Renville	1555	n/a	1830	2190	2512	2585	2592	2760
9205	158	81	19	SESW	Renville	1569	n/a	1790	2165	2500	absent	undiffer	2728
4779	158	81	21	SESW	Renville	1552	n/a	1810	2220	2510	2579	2587	2748

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
3660	158	81	22	SESW	Renville	1522	650	1737	2142	2430	2488	2495	2668
2643	158	81	28	SWSW	Renville	1556	712	1635	2200	2500	2555	2569	2740
5183	158	81	33	SENW	Renville	1554	695	1610	2165	2489	2540	2550	2730
10042	158	81	34	SESW	Renville	1544	n/a	1725	2105	2440	2506	2514	2680
9119	158	81	36	SWSE	Renville	1532	n/a	1710	2070	2420	2470	2480	2645
7134	158	82	2	NESW	Renville	1570	550	1800	2198	2500	absent	undiffer	2748
9976	158	82	3	SWNE	Renville	1588	570	1820	2216	2540	absent	undiffer	2792
3025	158	82	4	NESE	Renville	1563	n/a	1830	2230	2518	absent	undiffer	2750
5043	158	82	9	SWNE	Renville	1600	n/a	1862	2270	2555	absent	undiffer	2800
10204	158	82	11	NWSW	Renville	1556	590	1795	2170	2505	absent	undiffer	2742
3898	158	82	12	SWNW	Renville	1570	720	1780	2175	2500	absent	undiffer	2730
3297	158	82	13	NESE	Renville	1563	n/a	n/a	2180	2480	absent	undiffer	2720
10155	158	82	14	SENW	Renville	1583	650	1815	2219	2534	absent	undiffer	2797
10733	158	82	16	NESE	Renville	1594	n/a	1880	2250	2580	absent	undiffer	2814
4002	158	82	21	SWNE	Renville	1607	672	1870	2250	2575	absent	undiffer	2817
7882	158	82	22	NENE	Renville	1587	n/a	1820	2270	2545	absent	undiffer	2800
9204	158	82	24	SESE	Renville	1586	695	1800	2205	2525	absent	undiffer	2765
6411	158	82	26	NESW	Renville	1586	n/a	1845	2240	2570	absent	undiffer	2830
12561	158	82	27	SWNE	Renville	1585	n/a	n/a	2245	2569	absent	undiffer	2832
5052	158	82	30	NESW	Renville	1625	600	1941	2340	2640	2716	2722	2898
7706	158	82	31	NWSW	Renville	1627	680	1940	2370	2690	absent	undiffer	2960
12422	158	82	34	NWNW	Renville	1608	n/a	1875	2278	2622	absent	undiffer	2870
6269	158	82	35	NWSW	Renville	1564	n/a	1855	2230	2580	absent	undiffer	2850
4661	158	82	36	NESW	Renville	1578	n/a	1825	2220	2558	2628	2635	2820
4585	158	83	8	NWNW	Renville	1663	710	2049	2450	2750	2821	2830	3020
8263	158	83	13	NESE	Renville	1619	n/a	1892	2310	2622	2699	2704	2882
12301	158	83	16	SENW	Renville	1658	725	1997	2408	2740	absent	undiffer	3012
7950	158	83	18	NENE	Renville	1655	n/a	2030	2440	2755	2839	2843	3030
5932	158	83	24	NWSE	Renville	1628	685	1960	2350	2660	2730	2738	2940
5390	158	83	25	SWNW	Renville	1635	n/a	1990	2395	2700	2782	2790	2980
5276	158	83	26	NWNW	Renville	1630	710	2000	2400	2705	2781	2788	2970
7709	158	83	28	SWSW	Renville	1673	n/a	2032	2452	2770	2850	2855	3050
11082	158	83	36	SESW	Renville	1625	n/a	1948	2378	2696	2760	2768	2979
7916	158	84	10	NWSE	Renville	1722	715	2180	2605	2916	absent	undiffer	3181
3783	158	84	12	SWSW	Renville	1706	770	2153	2555	2860	2942	2947	3145
6409	158	84	18	NWNW	Renville	1768	920	2358	2787	3120	3204	3220	3440
8716	158	84	34	NENW	Renville	1763	920	2240	2700	3011	3092	3112	3310
4007	158	84	35	NWNE	Renville	1724	n/a	n/a	2620	2925	absent	undiffer	3226
6007	158	85	3	SENW	Renville	1991	n/a	2489	2910	3240	3325	3340	3512
12193	158	85	5	SWSE	Renville	1836	975	2520	2982	3300	3388	3400	3590
12464	158	85	7	NWNW	Renville	1838	1145	2590	3027	3340	3421	3438	3620
5902	158	85	8	SENE	Renville	1833	n/a	2508	2964	3278	3362	3374	3586
5872	158	85	9	SWSE	Renville	1818	n/a	n/a	2936	3256	3328	3334	3560
12326	158	85	10	SENE	Renville	1790	n/a	2430	2848	3171	3252	3264	3458
12210	158	85	11	SESW	Renville	1783	960	2420	2840	3175	3260	3276	3466
7530	158	85	12	NWSE	Renville	1779	875	2375	2795	3132	3208	3220	3445
10411	158	85	13	SENW	Renville	1785	1040	2390	2817	3140	3224	3238	3418
12719	158	85	14	SENE	Renville	1766	1010	2390	2813	3150	3230	3240	3422
12545	158	85	15	NENE	Renville	1804	982	2450	2885	3211	3290	3300	3495
12159	158	85	16	NWSE	Renville	1825	1100	2515	2948	3270	3368	3379	3570
5864	158	85	17	NENW	Renville	1823	1090	2538	2998	3320	3409	3421	3640
11788	158	85	21	NWNW	Renville	1831	1105	2535	2980	3309	3390	3405	3602
5885	158	85	22	NWSE	Renville	1819	n/a	2480	2915	3260	3333	3347	3540
5771	158	85	23	NWSW	Renville	1802	1009	2496	2904	3223	3309	3327	3505
5217	158	85	24	NWSW	Renville	1774	1018	2421	2832	3161	3240	3256	3440
10680	158	85	27	NESW	Renville	1823	1040	2495	2932	3270	3355	3371	3550
10501	158	85	28	NENE	Renville	1827	1010	2520	2962	3292	3378	3391	3579
12029	158	85	34	SWNE	Renville	1818	1010	2493	2945	3274	3360	3378	3568
5515	158	85	35	NENE	Renville	1792	1092	2455	2885	3208	3290	3307	3498
12399	158	86	1	NESW	Renville	1854	1150	2595	3050	3351	3439	3450	3634
6334	158	86	3	NESW	Renville	1887	1162	2679	3149	3454	3540	3558	3752
10674	158	86	11	SWNE	Renville	1875	1148	2640	3106	3416	3499	3511	3707
11547	158	86	14	SWSW	Renville	1879	1120	2665	3140	3449	3531	3547	3741

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
6371	158	86	15	SENE	Renville	1887	1080	2680	3149	3453	3538	3552	3745
10974	158	86	22	NENE	Renville	1890	1140	2670	3147	3468	3550	3571	3758
8262	158	86	23	SENW	Renville	1878	1137	2655	3112	3435	3515	3533	3721
4179	158	86	26	NWSE	Renville	1878	1165	2685	3130	3457	3546	3564	3765
7427	158	86	27	SWSW	Renville	1761	1050	2570	3050	3355	3440	3458	3655
6621	158	86	28	SENW	Renville	1818	1160	2653	3129	3443	3518	3531	3728
5326	158	86	29	NESE	Renville	1737	1000	2585	3057	3370	3450	3471	3662
6553	158	86	31	NESE	Renville	1975	1250	2860	3346	3660	3741	3762	3970
10274	158	87	19	SWNE	Ward	2109	1510	3171	3618	3940	4027	4042	4245
1876	158	87	22	SENE	Ward	2006	1334	2970	3424	3750	3830	3841	4045
6041	158	87	24	NWSW	Ward	1769	1315	2768	3208	3527	3603	3612	3820
12729	158	87	28	NWSE	Ward	2083	1480	3110	3572	3883	3975	3987	4190
10778	158	87	29	NESW	Ward	2157	1598	3210	3660	3982	4072	4084	4290
10275	158	87	32	NWNW	Ward	2191	1628	3240	3697	4025	4115	4126	4319
12229	158	88	5	SWSW	Mountrail	2237	1520	3285	3730	4060	4148	4165	4385
10546	158	88	17	SWNW	Mountrail	2264	1610	3365	3807	4134	4232	4240	4459
3540	158	88	30	SESE	Mountrail	2259	1632	3395	3837	4153	4249	4255	4470
3005	158	89	9	SWSW	Mountrail	2342	1808	3554	3993	4302	4395	4403	4621
2608	159	62	21	SESE	Cavalier	1571	n/a	492	955	1113	1186	1203	1270
27	159	63	28	NWNW	Cavalier	1562	n/a	550	911	1128	1189	1205	1270
702	159	71	10	SESW	Rolette	1599	n/a	1002	1435	1682	absent	undiffer	1826
4173	159	71	12	SWNE	Rolette	1630	n/a	985	1422	1662	absent	undiffer	1812
4360	159	72	1	NENW	Rolette	1613	n/a	1027	1482	1712	1780	1795	1870
2632	159	73	17	SENE	Rolette	1500	n/a	1054	1482	1703	absent	undiffer	1868
5549	159	75	33	NWNE	Bottineau	1485	n/a	1100	1518	1800	absent	undiffer	1975
1626	159	76	2	NWNW	McHenry	1460	n/a	1070	1525	1800	absent	undiffer	1978
1460	159	76	15	NENE	McHenry	1474	n/a	1102	1552	1820	absent	undiffer	2010
1652	159	77	12	NENW	McHenry	1481	n/a	1186	1621	1890	absent	undiffer	2059
1963	159	78	7	NESE	McHenry	1447	n/a	1225	1685	1970	2028	2031	2165
6353	159	78	15	SWSW	McHenry	1483	n/a	1263	1707	1993	2047	2051	2190
3620	159	79	2	SWSE	McHenry	1453	n/a	1255	1713	1990	2050	2055	2190
1538	159	79	3	NWNW	McHenry	1461	n/a	1261	1717	1998	2058	2062	2192
10284	159	79	6	NWNE	McHenry	1481	505	1265	1785	2075	2130	2138	2280
1919	159	79	11	SENE	McHenry	1453	n/a	1213	1726	2010	2058	2062	2203
11922	159	79	15	SENW	McHenry	1466	n/a	1180	1696	2012	2068	2071	2209
1947	159	79	22	NESE	McHenry	1450	n/a	1215	1730	2016	2071	2080	2218
3967	159	79	25	SWNE	McHenry	1450	n/a	1220	1740	2028	2086	2093	2228
6700	159	79	29	SENE	McHenry	1457	n/a	1257	1748	2068	2127	2134	2280
2675	159	79	34	NWNW	McHenry	1478	n/a	1268	1805	2095	2148	2154	2313
10608	159	80	8	SESW	McHenry	1504	n/a	1400	1925	2231	absent	undiffer	2450
3111	159	80	20	SWSW	McHenry	1508	n/a	1393	1936	2240	2295	2302	2450
11699	159	80	29	SWSE	McHenry	1499	n/a	1400	1933	2251	2300	2307	2463
4351	159	80	30	NESE	McHenry	1495	n/a	1414	1970	2268	2319	2329	2488
7990	159	80	31	NENE	McHenry	1502	n/a	1420	1962	2280	2341	2348	2508
11415	159	80	33	SWNW	McHenry	1497	364	1390	1896	2220	2284	2289	2442
9832	159	81	5	NWNW	Bottineau	1522	n/a	1650	1990	2281	2347	2351	2515
12794	159	81	7	SWSW	Bottineau	1532	n/a	1680	2012	2320	2389	2399	2550
4790	159	81	20	SESE	Bottineau	1517	n/a	1661	2050	2360	absent	undiffer	2581
1388	159	81	22	SWSW	Bottineau	1510	n/a	1675	2047	2347	2407	2413	2570
3218	159	81	24	NESE	Bottineau	1499	n/a	1600	1975	2258	2330	2340	2480
4363	159	81	26	SWNE	Bottineau	1506	n/a	n/a	n/a	n/a	absent	undiffer	n\a
4125	159	81	28	SWSW	Bottineau	1524	500	1720	2095	2400	2462	2471	2640
12081	159	81	31	NWSW	Bottineau	1557	425	1810	2165	2489	absent	undiffer	2720
5807	159	81	32	SWNW	Bottineau	1541	n/a	1780	2150	2470	2531	2541	2700
6379	159	81	33	NENE	Bottineau	1521	n/a	1712	2088	2394	2460	2470	2628
10943	159	81	36	NENE	Bottineau	1507	n/a	n/a	1988	2320	absent	undiffer	2551
9306	159	82	1	NWNE	Bottineau	1530	n/a	1686	2015	2313	2380	2388	2535
3539	159	82	4	SESE	Bottineau	1575	552	1768	2135	2431	2506	2513	2670
3742	159	82	5	SESW	Bottineau	1572	555	1790	2165	2465	2538	2541	2698
3195	159	82	6	SWSW	Bottineau	1586	835	1805	2190	2500	2570	2580	2741
10420	159	82	9	SENW	Bottineau	1568	n/a	1730	2103	2428	2490	2498	2651
7204	159	82	10	NESW	Bottineau	1568	838	1725	2100	2412	2485	2492	2645
3960	159	82	12	NENW	Bottineau	1538	n/a	1680	2040	2327	2396	2400	2558

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
12442	159	82	13	SESE	Bottineau	1548	838	1755	2111	2420	2488	2495	2655
12426	159	82	14	NWSE	Bottineau	1562	830	1730	2090	2417	2478	2484	2640
9989	159	82	16	NESE	Bottineau	1562	n/a	1735	2125	2430	absent	undiffer	2670
5705	159	82	18	NENW	Bottineau	1586	900	1820	2210	2512	2589	2597	2755
3981	159	82	22	SENW	Bottineau	1572	n/a	1625	2180	2485	2546	2555	2710
12285	159	82	26	SESW	Bottineau	1574	900	1495	2175	2472	absent	undiffer	2700
5024	159	82	29	NWNE	Bottineau	1588	n/a	1650	2210	2510	2581	2589	2750
5692	159	82	32	NENW	Bottineau	1587	n/a	1649	2220	2520	2582	2590	2750
4231	159	82	34	NESW	Bottineau	1580	465	1650	2210	2504	2572	2584	2735
12612	159	82	35	SWNE	Bottineau	1574	450	1500	2179	2482	2540	2549	2710
3409	159	83	4	NENW	Bottineau	1608	640	1720	2290	2600	2679	2689	2840
1709	159	83	10	NWNW	Bottineau	1597	508	1925	2280	2592	2661	n/a	n\a
3078	159	83	12	NWNW	Bottineau	1589	n/a	1655	2240	2555	2615	2627	2800
10084	159	83	13	NWSW	Bottineau	1604	700	1845	2255	2580	2640	2655	2820
3802	159	83	18	NENE	Bottineau	1636	720	1990	2385	2700	2768	2779	2940
8058	159	83	19	SWSE	Bottineau	1653	885	1975	2389	2704	2787	2794	2952
13505	159	83	21	NWSE	Bottineau	1644	n/a	1926	2322	2658	absent	undiffer	2902
3962	159	83	22	SESE	Bottineau	1617	533	1923	2307	2620	2692	2701	2870
3887	159	83	24	SENE	Bottineau	1595	605	1891	2258	2567	2641	2650	2808
5521	159	83	25	SESE	Bottineau	1614	585	1870	2261	2571	2650	2657	2810
10952	159	83	27	SWNW	Bottineau	1633	708	1905	2325	2640	2720	2730	2902
1206	159	83	31	SENE	Bottineau	1661	762	2039	2430	2740	2805	2812	3002
8032	159	83	33	NENW	Bottineau	1615	670	1927	2335	2652	2730	2740	2920
10897	159	83	35	SESW	Bottineau	1627	680	1936	2310	2612	2680	2688	2853
3427	159	84	2	SWNW	Renville	1679	795	2085	2468	2771	2851	2861	3050
11163	159	84	3	NWNE	Renville	1678	888	2080	2460	2780	2855	2870	3047
4106	159	84	4	SWSW	Renville	1698	n/a	2148	2531	2842	2917	2930	3118
6327	159	84	5	SWSE	Renville	1707	n/a	2171	2559	2862	2942	2961	3143
4040	159	84	6	SWNE	Renville	1736	900	2221	2605	2928	3006	3019	3198
6328	159	84	8	NENE	Renville	1697	691	2120	2545	2855	2941	2951	3149
4183	159	84	9	NWSE	Renville	1698	755	2175	2550	2867	2941	2955	3160
4613	159	84	11	NWNE	Renville	1663	n/a	2060	2450	2770	2850	2864	3050
7492	159	84	15	NESW	Renville	1693	755	2130	2521	2847	2919	2930	3120
8212	159	84	16	SWNE	Renville	1698	750	2140	2538	2860	2938	2951	3140
8818	159	84	18	SENE	Renville	1740	716	2246	2648	2970	3056	3079	3270
8783	159	84	21	SWSE	Renville	1710	787	2180	2585	2904	2983	2997	3186
7694	159	84	22	SWNE	Renville	1685	703	2113	2520	2843	2929	2941	3112
3902	159	84	23	NENW	Renville	1677	687	2085	2486	2800	2880	2890	3082
8424	159	84	29	SWNE	Renville	1735	822	2232	2635	2973	3061	3090	3290
5087	159	84	32	SWNW	Renville	1717	860	2270	2670	3010	3090	3108	3312
8810	159	84	34	NWSW	Renville	1714	740	2190	2595	2907	2985	2995	3190
11115	159	85	1	SESW	Renville	1744	785	2255	2650	2960	3049	3062	3245
6641	159	85	7	NWSE	Renville	1813	988	2510	2915	3255	3347	3355	3530
6344	159	85	13	SWSW	Renville	1735	813	2220	2665	2999	3071	3090	3310
8264	159	85	16	NENE	Renville	1762	860	2389	2770	3103	3183	3197	3378
6079	159	85	17	SWSW	Renville	1811	1032	2520	2925	3260	3349	3368	3545
4933	159	85	19	NESE	Renville	1837	n/a	2554	2969	3290	3370	3381	3568
5309	159	85	20	SENW	Renville	1824	922	2520	2922	3265	3329	3344	3544
11677	159	85	21	NENE	Renville	1802	908	2432	2825	3151	3230	3248	3430
6089	159	85	22	NESW	Renville	1788	903	2395	2800	3144	3220	3235	3410
7534	159	85	23	NWSW	Renville	1730	820	2317	2712	3051	3133	3147	3330
4943	159	85	26	NENW	Renville	1736	815	2348	2742	3090	3172	3180	3361
6416	159	85	27	NWSE	Renville	1772	860	2399	2805	3143	3225	3240	3415
12373	159	85	28	NWSW	Renville	1797	910	2460	2880	3205	3287	3300	3495
10775	159	85	29	SWSW	Renville	1839	1056	2520	2958	3282	3370	3384	3565
5952	159	85	31	NESW	Renville	1836	n/a	2550	2990	3300	3385	3394	3580
9093	159	85	32	NWNW	Renville	1843	972	2517	2955	3278	3359	3369	3560
5718	159	85	34	SESE	Renville	1812	968	2456	2867	3200	3285	3297	3482
8260	159	85	35	NWNW	Renville	1765	881	2376	2800	3133	3222	3239	3410
5589	159	86	12	SENW	Renville	1850	995	2565	2965	3284	3366	3379	3565
12003	159	86	15	NESW	Renville	1856	1070	2630	3080	3410	3499	3514	3708
12720	159	86	18	SWNE	Renville	1895	1340	2768	3178	3499	3582	3595	3782
8261	159	86	25	SENE	Renville	1847	1250	2560	3010	3340	3410	3424	3624

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
5851	159	86	26	SENW	Renville	1863	1178	2640	3087	3398	3482	3499	3689
7771	159	86	27	NENW	Renville	1861	1272	2665	3112	3430	3519	3534	3725
6157	159	86	36	SENE	Renville	1843	1035	2580	3032	3336	3410	3421	3620
2134	159	87	3	NENW	Ward	1920	n/a	2830	3255	3571	3659	3670	3870
11834	159	87	4	NWNE	Ward	1928	1415	2868	3272	3591	3680	3702	3900
12711	159	87	10	SESW	Ward	1930	1180	2860	3275	3589	3668	3691	3880
12529	159	87	13	NWSW	Ward	1914	1110	2816	3223	3555	3622	3642	3830
12333	159	87	14	SESE	Ward	1914	1111	2815	3222	3547	3619	3640	3832
12277	159	87	15	NWNE	Ward	1932	1140	2839	3247	3561	3636	3652	3848
9149	159	87	20	NENE	Ward	1956	1412	2961	3380	3704	3779	3795	4008
1801	159	87	21	SWNE	Ward	1954	1356	2900	3323	3640	3730	3753	3940
12219	159	87	23	SENE	Ward	1921	1340	2819	3228	3542	3630	3649	3832
12127	159	87	24	NWNW	Ward	1916	1349	2825	3235	3557	3632	3653	3849
13492	159	87	24	SENW	Ward	1921	n/a	2811	3222	3548	absent	undiffer	3829
12009	159	88	19	SESE	Ward	2102	1545	3210	3630	3951	4037	4045	4268
10326	159	88	21	NENW	Ward	2055	1420	3147	3562	3871	3960	3978	4188
9953	159	88	27	SWNW	Ward	2061	1450	3162	3580	3897	3984	3993	4208
9752	159	88	28	SWSE	Ward	2085	1480	3180	3605	3913	4008	4017	4224
1843	159	88	32	NWNW	Ward	2141	1540	3275	3718	4020	4109	4121	4345
8697	159	88	33	NENE	Ward	2087	1410	3180	3595	3911	4008	4018	4227
10273	159	89	2	NWNW	Ward	2056	1480	3148	3556	3850	3942	3963	4161
2342	160	57	3	NWSW	Cavalier	1555	n/a	300	686	900	963	1008	1050
31	160	60	32	NWSW	Cavalier	1612	n/a	433	822	1088	absent	undiffer	1160
390	160	67	24	SWSE	Towner	1544	490	733	1098	1335	1381	1409	1480
316	160	70	23	NWSW	Rolette	1691	n/a	1028	1422	1680	absent	undiffer	1825
4174	160	72	3	SESW	Rolette	1644	280	1023	1473	1719	absent	undiffer	1861
8353	160	72	12	SWSW	Rolette	1621	n/a	973	1430	1670	absent	undiffer	1820
917	160	72	22	NESE	Rolette	1602	n/a	1003	1440	1676	absent	undiffer	1823
582	160	73	8	SENE	Rolette	1565	n/a	1028	1473	1697	absent	undiffer	1851
11397	160	73	17	NESE	Rolette	1555	n/a	1005	1453	1704	absent	undiffer	1860
4645	160	75	9	SWSW	Bottineau	1509	460	1080	1528	1754	1820	1823	1920
1577	160	75	23	SWNW	Bottineau	1487	n/a	987	1492	1716	absent	undiffer	1885
1053	160	75	28	SWNE	Bottineau	1466	405	1040	1510	1735	absent	undiffer	1912
12700	160	76	3	SESE	Bottineau	1473	420	1005	1460	1752	absent	undiffer	1928
12468	160	76	14	SESW	Bottineau	1481	421	1002	1487	1762	absent	undiffer	1943
4864	160	76	15	SESE	Bottineau	1470	423	1073	1525	1787	absent	undiffer	1970
4644	160	76	24	NWNW	Bottineau	1469	n/a	984	1425	1755	absent	undiffer	1935
3057	160	77	6	SWNW	Bottineau	1464	n/a	1129	1608	1887	absent	undiffer	2062
362	160	77	29	NENW	Bottineau	1463	n/a	1125	1620	1908	absent	undiffer	2075
12540	160	78	1	NWNW	Bottineau	1474	n/a	1160	1635	1903	absent	undiffer	2089
13565	160	78	4	SESE	Bottineau	1476	n/a	n/a	1638	1948	absent	undiffer	2131
11758	160	78	5	NWSW	Bottineau	1456	n/a	1180	1668	1940	absent	undiffer	2130
8308	160	78	6	NESE	Bottineau	1466	n/a	1200	1678	1945	absent	undiffer	2140
1828	160	78	7	NENW	Bottineau	1453	n/a	1182	1635	1955	absent	undiffer	2145
11347	160	78	8	NWNE	Bottineau	1460	n/a	1167	1633	1933	absent	undiffer	2120
8066	160	78	10	NWSW	Bottineau	1465	n/a	1164	1651	1929	absent	undiffer	2109
11075	160	78	15	SESW	Bottineau	1455	n/a	1182	1652	1928	absent	undiffer	2110
13563	160	78	15	SWNE	Bottineau	1460	n/a	n/a	1620	1930	absent	undiffer	2108
5694	160	78	16	NESE	Bottineau	1457	n/a	1237	1660	1943	absent	undiffer	2135
2054	160	78	17	NENE	Bottineau	1459	n/a	1240	1665	1949	absent	undiffer	2125
2639	160	78	21	NWNW	Bottineau	1446	480	1170	1655	1928	absent	undiffer	2120
11810	160	78	25	SWNW	Bottineau	1460	n/a	1170	1660	1932	absent	undiffer	2118
1759	160	78	28	NWNE	Bottineau	1448	440	1131	1649	1915	1968	1972	2105
5659	160	78	36	SESE	Bottineau	1461	n/a	1160	1647	1928	absent	undiffer	2110
4316	160	79	3	SWSW	Bottineau	1469	380	1242	1730	2000	absent	undiffer	2190
5671	160	79	4	SENW	Bottineau	1470	n/a	1290	1725	2001	2060	2067	2205
10454	160	79	5	SESE	Bottineau	1467	n/a	1249	1718	2030	2083	2090	2230
5385	160	79	6	NWNW	Bottineau	1480	n/a	1280	1782	2065	2125	2135	2278
10453	160	79	7	SENW	Bottineau	1467	n/a	1270	1787	2065	absent	undiffer	2262
10456	160	79	8	SESE	Bottineau	1470	n/a	1240	1755	2030	absent	undiffer	2230
8843	160	79	11	NESW	Bottineau	1461	n/a	1215	1725	1995	2055	2061	2195
1957	160	79	14	SWNW	Bottineau	1471	n/a	1290	1745	2010	2065	2072	2205
11232	160	79	15	SENW	Bottineau	1466	n/a	1230	1750	2030	2088	2096	2224

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
4915	160	79	16	SESW	Bottineau	1464	430	1220	1750	2029	2087	2095	2225
11652	160	79	17	SENE	Bottineau	1465	n/a	1245	1770	2041	2097	2102	2242
3791	160	79	18	SENE	Bottineau	1468	500	1260	1778	2060	2105	2110	2235
3602	160	79	19	SESE	Bottineau	1469	425	1242	1767	2051	2107	2115	2262
3688	160	79	20	SESW	Bottineau	1464	395	1240	1766	2040	2100	2107	2243
13575	160	79	21	NENE	Bottineau	1465	n/a	1231	1721	2031	absent	undiffer	2219
3519	160	79	22	NWNW	Bottineau	1462	n/a	1225	1745	2018	2080	2089	2225
2912	160	79	24	NENE	Bottineau	1451	n/a	1202	1711	1972	2030	2033	2172
3830	160	79	26	SESW	Bottineau	1458	515	1215	1710	1987	2045	2050	2178
4836	160	79	28	SWNE	Bottineau	1460	n/a	1230	1752	2028	2085	2092	2239
5296	160	79	29	SESE	Bottineau	1466	n/a	1240	1755	2040	2085	2090	2232
10781	160	80	3	NENW	Bottineau	1493	n/a	1313	1832	2115	2160	2165	2303
962	160	80	5	SWNE	Bottineau	1503	290	1345	1872	2150	2210	2215	2360
10924	160	80	17	NWSW	Bottineau	1513	n/a	1330	1830	2135	2198	2204	2342
2596	160	80	19	SENW	Bottineau	1511	n/a	1368	1899	2188	2242	2249	2418
4192	160	81	5	NESW	Bottineau	1516	n/a	1540	1955	2241	2310	2318	2450
12166	160	81	6	NWSW	Bottineau	1522	n/a	1453	1982	2269	2334	2340	2500
4362	160	81	11	SENW	Bottineau	1508	n/a	1401	1912	2215	absent	undiffer	2422
2975	160	81	17	SENE	Bottineau	1514	n/a	1420	1955	2246	2306	2310	2475
12586	160	81	19	NWNW	Bottineau	1519	n/a	1435	1981	2280	2341	2347	2500
3484	160	81	30	SENW	Bottineau	1516	n/a	1458	2000	2295	2343	2349	2506
38	160	81	31	SWSE	Bottineau	1526	n/a	1333	1970	2279	2340	2350	2485
10360	160	81	32	SWSE	Bottineau	1515	730	1442	1966	2261	2327	2333	2480
5071	160	81	34	NWSW	Bottineau	1503	n/a	1412	1980	2278	absent	undiffer	2492
5100	160	82	1	NENW	Bottineau	1521	n/a	1473	1999	2296	2352	2360	2520
12121	160	82	2	SWNE	Bottineau	1538	678	1459	1992	2292	absent	undiffer	2512
12278	160	82	3	SWSW	Bottineau	1537	672	1465	2012	2308	2365	2372	2538
8895	160	82	5	NWSE	Bottineau	1544	689	1530	2075	2380	2451	2462	2625
10964	160	82	6	NENE	Bottineau	1550	738	1564	2088	2389	2466	2470	2616
10631	160	82	7	SENE	Bottineau	1552	710	1530	2092	2400	2468	2478	2632
11369	160	82	8	SESE	Bottineau	1537	699	1532	2050	2349	2405	2417	2582
1916	160	82	9	SWSE	Bottineau	1530	710	1527	2040	2333	2403	2411	2569
12006	160	82	12	NWNE	Bottineau	1527	710	1533	1963	2265	2314	2323	2480
12308	160	82	16	SWNW	Bottineau	1551	n/a	1695	2073	2382	2441	2450	2619
1728	160	82	19	SENE	Bottineau	1580	470	1798	2140	2435	2510	2517	2685
4781	160	82	21	SWNE	Bottineau	1542	n/a	1730	2052	2350	2411	2422	2580
3810	160	82	23	NESW	Bottineau	1533	720	1660	2050	2341	2409	2415	2568
11714	160	82	29	SWNW	Bottineau	1598	800	1790	2138	2440	2519	2530	2690
10831	160	83	1	NESE	Bottineau	1561	785	1800	2113	2416	2500	2509	2655
3598	160	83	2	SESE	Bottineau	1595	800	1840	2170	2465	2533	2542	2709
3067	160	83	8	SESE	Bottineau	1609	n/a	1898	2282	2591	2667	2680	2847
2770	160	83	14	SESE	Bottineau	1587	820	1789	2173	2477	2552	2563	2720
4205	160	83	15	NWNE	Bottineau	1600	810	1810	2206	2511	2589	2600	2749
5314	160	83	16	NESW	Bottineau	1609	890	1920	2268	2570	2649	2660	2820
12205	160	83	17	NESE	Bottineau	1581	888	1921	2264	2573	2647	2655	2815
3886	160	83	21	SWNE	Bottineau	1605	n/a	1893	2256	2553	2632	2644	2797
2899	160	83	22	SWNE	Bottineau	1599	n/a	1877	2227	2542	2604	2615	2780
4214	160	83	23	SENE	Bottineau	1583	n/a	1820	2170	2471	2551	2561	2718
3543	160	83	25	SWNE	Bottineau	1583	n/a	1835	2190	2500	2569	2580	2746
11443	160	83	26	SWNW	Bottineau	1597	861	1880	2230	2530	2608	2617	2771
5439	160	83	27	SENE	Bottineau	1602	605	1885	2235	2540	2620	2631	2799
5253	160	83	29	NESE	Bottineau	1613	651	1936	2304	2610	2685	2698	2852
2995	160	83	30	SWNW	Bottineau	1639	689	1980	2333	2637	2715	2730	2884
6480	160	83	36	SENW	Bottineau	1593	n/a	1819	2215	2522	2599	2607	2772
3659	160	84	3	NWSW	Renville	1658	1010	2040	2416	2730	2810	2820	2972
11053	160	84	8	NESW	Renville	1668	945	2108	2475	2791	2870	2880	3045
11905	160	84	14	SESE	Renville	1645	961	2020	2352	2660	2739	2750	2911
8616	160	84	16	NWSE	Renville	1650	960	2080	2417	2730	2800	2811	2972
8891	160	84	17	NESW	Renville	1690	1065	2153	2500	2810	2890	2904	3059
4203	160	84	18	SESW	Renville	1696	1130	2180	2568	2879	2960	2972	3155
4604	160	84	19	NWSE	Renville	1704	680	2188	2552	2862	2942	2952	3113
4270	160	84	20	NWSW	Renville	1684	692	2146	2520	2830	2910	2920	3100
9818	160	84	21	NENE	Renville	1655	605	2080	2430	2737	2812	2825	2980

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
3572	160	84	26	NENW	Renville	1658	663	2052	2400	2700	2782	2790	2950
10534	160	84	27	NWSE	Renville	1664	633	2060	2418	2727	2806	2817	2988
9280	160	84	28	NESE	Renville	1669	649	2080	2449	2757	2840	2850	3024
12267	160	84	29	NENE	Renville	1675	710	2025	2482	2800	2880	2890	3059
4043	160	84	31	SESW	Renville	1735	770	2235	2610	2910	2989	3000	3190
7227	160	84	32	SWNW	Renville	1707	730	2200	2570	2875	2953	2968	3160
10167	160	84	33	SWSE	Renville	1692	640	2121	2506	2820	2895	2909	3098
5640	160	84	34	SENE	Renville	1674	611	2076	2460	2769	2830	2844	3028
11881	160	84	35	NWNE	Renville	1637	n/a	2027	2370	2680	2760	2770	2946
2697	160	84	36	SWSW	Renville	1633	n/a	2030	2390	2690	2759	2770	2945
4298	160	85	1	SESE	Renville	1701	699	2199	2529	2830	2910	2921	3069
3667	160	85	3	SWNE	Renville	1737	730	2280	2612	2915	2991	3009	3161
11556	160	85	5	SWSW	Renville	1761	804	2350	2734	3039	3122	3136	3307
4140	160	85	6	NENW	Renville	1753	812	2370	2720	3020	3104	3125	3285
13564	160	85	8	SWSE	Renville	1753	n/a	2355	2708	3039	absent	undiffer	3290
11129	160	85	9	SESE	Renville	1760	830	2320	2700	3013	3097	3110	3300
11901	160	85	10	SWSE	Renville	1759	790	2320	2678	2990	3068	3080	3287
11361	160	85	11	SESE	Renville	1736	640	2260	2635	2947	3030	3043	3230
11792	160	85	12	SWNE	Renville	1717	n/a	2242	2580	2895	2974	2985	3184
3836	160	85	13	SENW	Renville	1720	671	2251	2610	2915	2999	3007	3195
7299	160	85	14	SWSE	Renville	1742	768	2300	2660	2980	3062	3080	3274
10760	160	85	15	NWNW	Renville	1758	775	2330	2690	3004	3085	3098	3250
3526	160	85	16	SESW	Renville	1748	860	2364	2730	3040	3121	3138	3322
13619	160	85	17	NENE	Renville	1749	n/a	n/a	2718	3038	3118	3129	3300
6933	160	85	21	SWNE	Renville	1740	700	2340	2711	3020	3110	3118	3330
6044	160	85	24	SESW	Renville	1735	730	2228	2629	2940	3015	3030	3211
3713	160	85	25	NESE	Renville	1734	739	2220	2621	2939	3001	3011	3198
5465	160	85	26	SWNW	Renville	1748	804	2309	2685	2987	3070	3088	3291
6446	160	85	27	NWNE	Renville	1743	780	2335	2712	3028	3111	3130	3323
3335	160	85	31	NESW	Renville	1782	855	2461	2855	3178	3261	3278	3465
6099	160	85	34	NENE	Renville	1739	798	2303	2674	2998	3076	3096	3247
9092	160	85	35	NENW	Renville	1753	805	2307	2681	2988	3074	3093	3320
8477	160	85	36	NESW	Renville	1747	855	2270	2660	2973	3044	3064	3295
7716	160	86	4	SWNE	Renville	1818	n/a	2530	2920	3250	3330	3353	3550
11809	160	86	5	SWNE	Renville	1858	979	2590	2978	3306	3395	3415	3597
12012	160	86	8	NESE	Renville	1859	970	2621	3030	3353	3434	3465	3642
8041	160	86	11	SWNE	Renville	1698	815	2364	2745	3063	3148	3171	n\a
13665	160	86	14	SWSE	Renville	0	n/a	n/a	n/a	3153	3233	3252	3422
12077	160	86	15	SESE	Renville	1830	908	2520	2921	3238	3324	3343	3521
12008	160	86	16	SENW	Renville	1856	951	2592	3010	3330	3417	3438	3618
12880	160	86	17	SWSE	Renville	1857	954	2635	3068	3379	3465	3481	3667
12759	160	86	20	SESE	Renville	1849	n/a	2632	3029	3348	3428	3448	3626
12587	160	86	21	SWSW	Renville	1859	1015	2631	3061	3381	3470	3487	3680
12041	160	86	22	NENE	Renville	1838	928	2535	2930	3242	3328	3357	3530
8851	160	86	23	NESW	Renville	1823	950	2533	2917	3228	3311	3335	3527
11038	160	86	25	SWSW	Renville	1817	910	2517	2910	3232	3316	3332	3485
12758	160	86	27	SWSW	Renville	1858	1050	2618	3010	3323	3400	3420	3602
12740	160	86	29	NENE	Renville	1849	1070	2652	3043	3356	3430	3451	3634
11951	160	86	34	NWNW	Renville	1854	955	2600	3009	3321	3406	3427	3600
12647	160	86	35	SESE	Renville	1832	1160	2544	2954	3288	3370	3390	3575
6819	160	87	1	SWNE	Ward	1842	1000	2618	3037	3345	3432	3454	3640
3884	160	87	10	NENE	Ward	1858	1005	2710	3090	3390	3475	3497	3674
1128	160	87	13	SWNW	Ward	1857	1038	2702	3085	3400	3482	3497	3690
11849	160	87	15	NESE	Ward	1870	1051	2712	3130	3442	3512	3537	3727
6482	160	87	16	NESE	Ward	1893	1168	2799	3174	3478	3560	3571	3771
1698	160	87	22	NWNE	Ward	1892	1168	2803	3175	3480	3565	3578	3762
1410	160	88	5	SESE	Ward	1942	1205	2922	3302	3600	3682	3692	3900
12220	160	88	10	SWSW	Ward	1953	1222	2912	3332	3638	3720	3740	3940
12191	160	88	25	SENE	Ward	1948	1235	2909	3320	3612	3688	3702	3900
4097	160	88	36	NENW	Ward	1952	1295	2976	3368	3669	3742	3760	3962
1808	160	89	11	NWNE	Ward	1956	1280	2895	3350	3627	3695	3704	3928
10272	160	89	15	SWNE	Ward	1983	1313	3040	3450	3744	3830	3837	4056
8699	160	89	20	NENE	Ward	2046	1420	3172	3580	3880	3980	3988	4200

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
14083	161	57	5		Cavalier	1555	n/a	287	663	902	931	1020	1068
14084	161	59	26		Cavalier	1649	158	435	828	1060	1097	1162	1238
2521	161	62	35	NESE	Cavalier	1581	n/a	450	836	1090	1128	1150	1233
14085	161	65	26	SWNE	Towner	1590	n/a	661	1101	1280	1317	1330	n\a
100	161	68	35	SWSE	Towner	1717	303	977	1355	1574	absent	undiffer	1709
754	161	70	18	SWSW	Rolette	1734	n/a	1092	1472	1728	absent	undiffer	1878
2685	161	71	8	NENE	Rolette	1725	n/a	1080	1488	1730	absent	undiffer	1887
6375	161	72	1	NWSE	Rolette	1709	n/a	1043	1503	1760	absent	undiffer	1910
9938	161	72	6	SESE	Rolette	1700	n/a	1061	1507	1753	absent	undiffer	1908
3083	161	72	8	NWSE	Rolette	1665	n/a	1027	1486	1735	absent	undiffer	1890
568	161	72	11	SESW	Rolette	1677	n/a	1056	1478	1718	absent	undiffer	1875
1630	161	72	19	NWSE	Rolette	1632	n/a	1023	1482	1724	absent	undiffer	1880
1666	161	73	2	SWNE	Rolette	1675	n/a	1075	1529	1778	absent	undiffer	1931
2862	161	73	21	NWSE	Rolette	1607	n/a	1052	1500	1730	1812	1820	1883
571	161	73	27	SWNW	Rolette	1594	n/a	1034	1473	1697	absent	undiffer	1860
1102	161	74	2	SWNE	Bottineau	1664	n/a	1070	1560	1790	absent	undiffer	1940
1579	161	74	21	SWSW	Bottineau	1589	n/a	1080	1543	1775	absent	undiffer	1942
8878	161	74	23	SESE	Bottineau	1602	n/a	1028	1503	1766	absent	undiffer	1930
969	161	75	8	SWSW	Bottineau	1560	n/a	1080	1545	1770	absent	undiffer	1940
348	161	75	12	SWSW	Bottineau	1603	n/a	1050	1540	1812	absent	undiffer	1970
9559	161	75	14	NENW	Bottineau	1590	n/a	1010	1480	1788	absent	undiffer	1960
6358	161	75	18	NESE	Bottineau	1549	n/a	1057	1498	1768	absent	undiffer	1950
3905	161	75	21	NENE	Bottineau	1559	n/a	1072	1505	1770	absent	undiffer	1935
6356	161	75	33	SESE	Bottineau	1522	n/a	1078	1510	1738	absent	undiffer	1905
5507	161	76	1	SENW	Bottineau	1581	597	1110	1572	1796	1868	1874	1978
4646	161	76	8	NWNW	Bottineau	1508	439	1175	1545	1821	absent	undiffer	2000
544	161	76	22	NENW	Bottineau	1505	n/a	1145	1533	1807	1870	1877	1995
5280	161	76	24	SWSW	Bottineau	1527	620	1120	1505	1770	absent	undiffer	1950
9522	161	77	21	SWNW	Bottineau	1474	n/a	1100	1530	1849	absent	undiffer	2029
327	161	77	22	NESE	Bottineau	1481	407	1192	1608	1851	absent	undiffer	2032
1527	161	77	24	NENE	Bottineau	1487	n/a	1140	1548	1820	absent	undiffer	2007
11286	161	78	1	SESW	Bottineau	1479	487	1139	1608	1880	absent	undiffer	2066
8051	161	78	4	SWSW	Bottineau	1486	515	1188	1620	1942	2000	2005	2120
2908	161	78	7	NENE	Bottineau	1479	n/a	1273	1675	1943	2008	2015	2120
3779	161	78	9	SENW	Bottineau	1487	505	1265	1665	1942	absent	undiffer	2122
2157	161	78	11	SWNW	Bottineau	1478	n/a	1219	1620	1895	absent	undiffer	2081
2921	161	78	15	SWNE	Bottineau	1482	n/a	1243	1650	1920	absent	undiffer	2100
3991	161	78	16	SENW	Bottineau	1482	n/a	1255	1662	1925	absent	undiffer	2110
8029	161	78	21	SWNW	Bottineau	1482	n/a	1199	1640	1950	absent	undiffer	2135
11287	161	78	22	SESE	Bottineau	1488	n/a	1185	1632	1932	absent	undiffer	2112
1667	161	78	26	SENE	Bottineau	1479	n/a	1165	1631	1894	absent	undiffer	2070
10045	161	78	28	SWNW	Bottineau	1467	505	1200	1681	1947	2005	2012	2127
9302	161	78	29	SWNE	Bottineau	1464	497	1200	1680	1949	2010	2019	2135
3855	161	78	30	NESE	Bottineau	1448	n/a	1184	1658	1932	1992	1998	2125
8030	161	78	33	SWNE	Bottineau	1475	482	1188	1682	1960	absent	undiffer	2139
11863	161	78	34	SENE	Bottineau	1479	n/a	1152	1660	1938	absent	undiffer	2110
8995	161	79	1	SENW	Bottineau	1479	485	1211	1682	1946	2010	2015	2142
2094	161	79	3	NWSW	Bottineau	1476	n/a	1239	1720	1987	2045	2051	2180
2085	161	79	4	NWNE	Bottineau	1487	n/a	1261	1731	2001	2065	2071	2192
2064	161	79	5	NWNE	Bottineau	1481	n/a	1275	1750	2021	2081	2091	2220
14086	161	79	5	SWSW	Bottineau	1483	n/a	1268	1747	2018	2073	2080	2215
2282	161	79	6	NWSW	Bottineau	1492	n/a	1290	1769	2032	2096	2101	2231
2359	161	79	7	NWNW	Bottineau	1489	480	1279	1759	2022	2085	2090	2227
4721	161	79	8	NWSW	Bottineau	1482	483	1270	1752	2024	2088	2094	2223
2073	161	79	10	SESE	Bottineau	1476	n/a	1243	1712	1980	2036	2040	2175
1838	161	79	11	NWNE	Bottineau	1468	501	1220	1695	1963	2026	2031	2151
11916	161	79	12	SESE	Bottineau	1465	482	1210	1676	1940	1990	1997	2122
3945	161	79	14	NWNW	Bottineau	1461	n/a	1211	1697	1968	2030	2038	2154
1985	161	79	15	SENE	Bottineau	1474	n/a	1236	1715	1985	2044	2050	2162
3203	161	79	17	SESW	Bottineau	1478	n/a	1266	1753	2021	2084	2090	2220
5213	161	79	20	SENW	Bottineau	1482	n/a	1257	1743	2021	2070	2079	2207
4004	161	79	21	NWSW	Bottineau	1485	n/a	1255	1738	2012	2072	2079	2212
2140	161	79	23	NWSE	Bottineau	1461	n/a	1206	1700	1961	2021	2028	2152

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
12389	161	79	25	NWNE	Bottineau	1501	415	1261	1685	1947	2005	2012	2145
5175	161	79	26	NENW	Bottineau	1473	n/a	1290	1725	2000	2051	2059	2195
1932	161	79	27	SENW	Bottineau	1480	n/a	1295	1725	2005	2050	2058	2196
5172	161	79	28	NWNE	Bottineau	1474	n/a	1310	1728	1993	2052	2061	2193
3504	161	79	29	SENW	Bottineau	1485	n/a	1280	1771	2042	2100	2109	2240
5239	161	79	32	SENE	Bottineau	1487	n/a	1271	1765	2044	2103	2110	2250
7513	161	79	34	SENW	Bottineau	1479	n/a	1248	1717	1998	2045	2051	2160
3711	161	79	36	SESE	Bottineau	1459	n/a	1225	1700	1975	2026	2032	2170
4670	161	80	1	NESE	Bottineau	1488	492	1300	1775	2048	2107	2110	2249
5943	161	80	9	NESW	Bottineau	1500	n/a	1349	1839	2107	absent	undiffer	2311
2202	161	80	10	NENE	Bottineau	1502	550	1325	1812	2085	absent	undiffer	2300
2248	161	80	12	SENE	Bottineau	1483	n/a	1288	1777	2049	2105	2111	2251
12551	161	80	19	SESE	Bottineau	1506	370	1384	1894	2178	2240	2247	2382
3258	161	80	26	SWNW	Bottineau	1493	n/a	1335	1831	2118	2172	2179	2320
4924	161	81	2	NENE	Bottineau	1514	n/a	1392	1870	2150	absent	undiffer	2360
11587	161	81	4	SWSW	Bottineau	1521	590	1438	1949	2235	2299	2302	2459
10362	161	81	5	NENW	Bottineau	1528	575	1400	1929	2218	2285	2288	2438
3544	161	81	7	SWNE	Bottineau	1520	609	1433	1960	2251	2315	2327	2480
7052	161	81	9	NENE	Bottineau	1511	580	1390	1927	2219	2281	2287	2440
2500	161	81	11	NWNW	Bottineau	1511	n/a	1269	1885	2160	2221	2230	2375
8608	161	81	15	NENE	Bottineau	1507	n/a	1410	1904	2190	absent	undiffer	2408
2369	161	81	16	SWSW	Bottineau	1502	n/a	1430	1958	2249	2308	2317	2480
910	161	81	18	NWSW	Bottineau	1521	n/a	1465	1986	2275	2340	2350	2510
11156	161	81	19	SWNW	Bottineau	1534	n/a	1512	2020	2305	2370	2380	2535
3653	161	81	20	NWNE	Bottineau	1520	390	1489	1962	2252	2313	2320	2478
11400	161	81	21	SENE	Bottineau	1523	n/a	1434	1960	2250	2317	2320	2472
9136	161	81	22	NESW	Bottineau	1509	375	1430	1938	2230	2296	2302	2450
3766	161	81	28	NESW	Bottineau	1509	n/a	1420	1951	2236	2299	2311	2461
5991	161	82	8	NENE	Bottineau	1564	n/a	1567	2031	2311	2379	2388	2540
2542	161	82	11	NESW	Bottineau	1533	n/a	1460	1988	2271	2332	2345	2500
9491	161	82	12	SWNE	Bottineau	1528	230	1430	1988	2271	2332	2345	2500
6391	161	82	13	NWSW	Bottineau	1539	230	1430	1972	2260	2328	2340	2505
6692	161	82	14	SESW	Bottineau	1537	260	1472	1996	2280	2353	2364	2515
3771	161	82	15	NENE	Bottineau	1551	n/a	n/a	n/a	2284	2350	2361	2532
11592	161	82	17	NWNW	Bottineau	1568	n/a	1550	2102	2390	2470	2485	2628
2743	161	82	18	SWNE	Bottineau	1572	n/a	1470	2113	2395	2470	2480	2631
3207	161	82	20	NESE	Bottineau	1570	n/a	1430	2095	2391	2455	2460	2612
8522	161	82	23	SWNE	Bottineau	1533	n/a	1362	2002	2290	2358	2368	2517
8521	161	82	24	NENW	Bottineau	1539	n/a	1365	1995	2288	2355	2367	2521
1790	161	82	24	SWSE	Bottineau	1535	633	1450	2010	2300	absent	undiffer	2534
14087	161	82	25		Bottineau	1524	n/a	1515	1995	2290	2356	2365	2527
11271	161	82	28	SENE	Bottineau	1551	670	1500	2060	2342	absent	undiffer	2568
9181	161	82	31	SESE	Bottineau	1572	780	1620	2190	2500	2575	2588	2743
6257	161	82	34	SWNW	Bottineau	1547	700	1535	2075	2360	absent	undiffer	2599
6535	161	83	2	NENE	Bottineau	1589	n/a	n/a	2142	2430	2495	2508	2680
6206	161	83	5	NENW	Bottineau	1582	790	1685	2225	2515	absent	undiffer	2750
4206	161	83	7	NENW	Bottineau	1614	925	1740	2294	2580	2660	2670	2830
5538	161	83	17	NWNW	Bottineau	1613	487	1725	2270	2575	2660	2671	2828
6487	161	83	20	NWNE	Bottineau	1616	495	1735	2300	2593	2670	2690	2835
3705	161	83	21	SESE	Bottineau	1621	570	1705	2269	2556	2633	2645	2805
3334	161	83	36	NWNW	Bottineau	1589	530	1655	2220	2525	2590	2605	2762
11054	161	84	1	NESE	Renville	1611	670	1740	2270	2566	2650	2652	2810
10665	161	84	6	NWNW	Renville	1698	850	1960	2496	2793	2880	2900	3090
3987	161	84	10	SENW	Renville	1666	585	1885	2415	2715	2778	2795	2952
5626	161	84	19	NESE	Renville	1693	685	2195	2530	2830	absent	undiffer	3070
1136	161	84	23	SENW	Renville	1651	n/a	2071	2410	2711	2788	2804	2963
1727	161	84	32	SESW	Renville	1706	695	2205	2540	2845	2917	2930	3085
6624	161	85	1	SENW	Renville	1715	n/a	n/a	2535	2840	2920	2940	3140
6684	161	85	2	NENW	Renville	1713	n/a	2205	2538	2822	2909	2919	3102
5644	161	85	3	NWSW	Renville	1758	795	2298	2640	2928	3011	3028	3220
3368	161	85	6	NWNW	Renville	1770	743	2340	2680	2985	3051	3069	3260
5518	161	85	10	NWNW	Renville	1756	745	2298	2642	2926	3010	3027	3212
815	161	85	13	SWNW	Renville	1707	715	2220	2560	2853	2946	2952	3150

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
6384	161	85	14	SENW	Renville	1750	735	2240	2618	2911	2990	3005	3195
4576	161	85	17	NENE	Renville	1771	750	2352	2698	2999	3082	3097	3278
3350	161	85	18	NWSE	Renville	1765	898	2385	2730	3030	3112	3131	3295
9538	161	85	19	SESE	Renville	1772	852	2380	2761	3065	3150	3180	3365
5852	161	85	20	NWNW	Renville	1757	843	2373	2720	3020	3102	3118	3315
9881	161	85	23	NESE	Renville	1749	770	2247	2620	2918	2995	3016	3205
5331	161	85	24	SESW	Renville	1735	810	2265	2605	2917	2990	3010	3175
4930	161	85	26	SWSW	Renville	1763	870	2330	2670	2970	3052	3065	3225
11342	161	85	28	SWSW	Renville	1752	830	2370	2722	3028	3112	3131	3320
3563	161	85	29	SWNE	Renville	1758	882	2389	2731	3038	3118	3140	3320
6875	161	85	35	SWSE	Renville	1756	940	2310	2675	2975	3060	3080	3260
12128	161	86	4	NENW	Renville	1719	935	2312	2690	2985	3059	3075	3260
3852	161	86	5	SESW	Renville	1844	895	2535	2867	3163	3244	3261	3445
10955	161	86	8	SWSW	Renville	1856	960	2537	2908	3204	3290	3310	3480
7450	161	86	9	SENW	Renville	1815	870	2478	2810	3106	3191	3207	3385
3452	161	86	9	SESW	Renville	1835	920	2520	2862	3160	3245	3264	3450
8084	161	86	10	NWSW	Renville	1813	838	2485	2830	3125	3210	3229	3410
3789	161	86	15	NWNW	Renville	1813	n/a	2498	2845	3147	3228	3250	3443
11274	161	86	17	SWSE	Renville	1853	940	2550	2931	3239	3330	3345	3535
10956	161	86	18	NENE	Renville	1851	920	2540	2911	3208	3282	3302	3492
10826	161	86	20	NWNE	Renville	1851	960	2543	2910	3211	3295	3318	3492
12567	161	86	21	NWSW	Renville	1858	860	2550	2925	3249	3341	3347	3532
6507	161	86	22	SENW	Renville	1829	915	2505	2885	3195	3273	3294	3486
11043	161	86	27	NESE	Renville	1826	960	2505	2892	3210	3286	3304	3484
10614	161	86	28	NENE	Renville	1843	925	2536	2917	3231	3318	3335	3520
12023	161	86	30	NESE	Renville	1850	881	2600	2979	3280	3368	3388	3565
3760	161	86	32	NWSW	Renville	1843	915	2640	2991	3307	3386	3405	3582
7751	161	86	33	NENW	Renville	1886	950	2584	2967	3300	3367	3388	3578
13592	161	86	33	SESE	Renville	1866	n/a	n/a	2979	3305	3403	3408	3600
3608	161	86	35	SENE	Renville	1802	900	2510	2862	3180	3269	3290	3480
5757	161	86	36	NWNE	Renville	1702	772	2378	2767	3080	3165	3185	3371
5928	161	87	3	SESW	Renville	1857	994	2505	2970	3268	3350	3365	3547
11936	161	87	4	SWNE	Renville	1876	1040	2621	3000	3291	3371	3388	3580
4533	161	87	9	NESE	Renville	1875	1000	2678	3023	3318	3400	3418	3605
3968	161	87	10	NESE	Renville	1864	1030	2645	2985	3277	3360	3371	3565
3205	161	87	11	SESE	Renville	1852	1045	2622	2960	3252	3341	3359	3541
10786	161	87	12	SESE	Renville	1845	956	2547	2910	3199	3285	3301	3474
6146	161	87	13	SENE	Renville	1844	1000	2589	2920	3212	3300	3321	3490
12609	161	87	14	NWSW	Renville	1862	972	2617	2995	3292	3382	3395	3570
11737	161	87	15	NESE	Renville	1870	998	2626	3010	3307	absent	undiffer	3570
12084	161	87	17	NENW	Renville	1885	1060	2680	3065	3352	3440	3452	3631
12543	161	87	18	NESW	Renville	1893	1075	2710	3075	3380	3462	3478	3668
10978	161	87	24	SWSW	Renville	1857	998	2615	2982	3286	3371	3388	3558
12467	161	87	25	NWNE	Renville	1854	1010	2615	2985	3279	3357	3374	3555
11600	161	87	26	SWSE	Renville	1867	1055	2665	3060	3369	3450	3467	3647
7976	161	87	34	SWSE	Renville	1899	n/a	2728	3145	3440	3530	3540	3735
12530	161	88	9	SENE	Ward	1922	n/a	2798	3191	3485	3565	3580	3777
10270	161	88	13	SWNW	Ward	1910	1200	2788	3167	3475	3568	3578	3770
11042	161	88	18	NESE	Ward	1941	1200	2943	3335	3620	3710	3732	3907
10271	161	88	25	NWSW	Ward	1925	1140	2807	3220	3511	3591	3610	3804
11555	161	88	33	NWNE	Ward	1952	1220	2930	3350	3632	3725	3739	3920
12190	161	88	34	NWSE	Ward	1930	1133	2858	3274	3559	3636	3655	3840
11050	161	89	36	SESW	Burke	1948	1545	2993	3401	3696	3785	3800	4003
14088	162	57	7		Cavalier	1498	n/a	207	582	825	853	956	1005
14089	162	59	13		Cavalier	1583	n/a	275	656	890	931	990	1048
14090	162	59	30		Cavalier	1624	n/a	343	725	955	995	1045	1085
14091	162	59	32		Cavalier	1640	n/a	358	747	985	1022	1062	1133
1694	162	63	10	NWNW	Cavalier	1586	n/a	553	932	1190	1218	1235	1255
37	162	64	26	SWNW	Cavalier	1630	n/a	630	1012	1253	absent	undiffer	1350
14092	162	65	16	SWNE	Towner	1602	n/a	645	1009	1255	1300	1307	n\a
3980	162	68	7	SWSE	Towner	1761	n/a	990	1333	1580	absent	undiffer	1722
615	162	69	20	SENE	Rolette	1806	n/a	1075	1434	1691	1737	1754	1838
9576	162	70	23	SWSW	Rolette	1919	n/a	1231	1608	1866	1915	1918	2015

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
1517	162	71	16	NWNW	Rolette	2159	n/a	1512	1890	2132	absent	undiffer	2286
2220	162	72	25	SESE	Rolette	1939	535	1260	1699	1945	absent	undiffer	2090
328	162	74	28	NWNW	Bottineau	1895	n/a	1310	1804	2037	absent	undiffer	2190
5764	162	75	12	NWNW	Bottineau	2242	688	1735	2180	2425	absent	undiffer	2590
8326	162	75	27	NWNE	Bottineau	1759	n/a	1177	1680	1941	absent	undiffer	2105
1585	162	75	28	NENW	Bottineau	1705	n/a	1140	1665	1895	absent	undiffer	2060
1525	162	76	9	NWNE	Bottineau	1674	n/a	1192	1668	1901	absent	undiffer	2082
12053	162	76	10	SWSE	Bottineau	1680	n/a	1163	1618	1891	absent	undiffer	2058
895	162	76	14	NWNW	Bottineau	1683	n/a	1161	1661	1900	absent	undiffer	2059
9009	162	76	19	SWNE	Bottineau	1605	n/a	1068	1608	1881	1927	1931	2050
12565	162	76	26	SESW	Bottineau	1608	577	1040	1541	1809	absent	undiffer	1982
1583	162	76	35	SWSW	Bottineau	1627	591	1118	1587	1827	absent	undiffer	2002
5277	162	77	11	SWSW	Bottineau	1543	n/a	1233	1567	1817	absent	undiffer	1990
12518	162	77	30	NWSE	Bottineau	1488	462	1090	1541	1842	absent	undiffer	2023
3822	162	77	33	SWSW	Bottineau	1484	468	1180	1562	1835	absent	undiffer	2017
1529	162	78	1	SWNW	Bottineau	1503	n/a	1161	1584	1831	absent	undiffer	2017
1642	162	78	3	NWSE	Bottineau	1505	n/a	1220	1620	1868	1930	1937	2053
1586	162	78	4	SWNE	Bottineau	1507	n/a	1240	1637	1875	1935	1941	2070
6385	162	78	5	SENW	Bottineau	1502	n/a	1207	1605	1872	1931	1940	2068
11609	162	78	6	NWSW	Bottineau	1506	445	1202	1632	1898	1960	1971	2090
1964	162	78	7	NENE	Bottineau	1503	n/a	1248	1657	1901	1951	1962	2091
2638	162	78	12	SWSE	Bottineau	1495	n/a	1101	1574	1838	absent	undiffer	2030
3961	162	78	14	NWSE	Bottineau	1498	450	1147	1600	1870	absent	undiffer	2058
3654	162	78	15	SENW	Bottineau	1502	n/a	1160	1604	1868	absent	undiffer	2060
10648	162	78	16	NENE	Bottineau	1501	445	1158	1600	1871	absent	undiffer	2050
11601	162	78	18	SESE	Bottineau	1502	460	1175	1652	1918	1980	1986	2088
1850	162	78	19	SWSE	Bottineau	1494	n/a	1174	1655	1918	1980	1987	2107
3827	162	78	20	SESE	Bottineau	1502	n/a	1175	1641	1912	1962	1968	2092
2058	162	78	25	SENW	Bottineau	1491	467	1140	1605	1879	absent	undiffer	2067
11028	162	78	26	SWSE	Bottineau	1492	n/a	1131	1600	1870	absent	undiffer	2052
3776	162	78	28	NESE	Bottineau	1493	n/a	1180	1640	1912	1973	1981	2102
11434	162	78	30	NENW	Bottineau	1493	505	1190	1652	1921	1982	1991	2115
4655	162	78	31	SESW	Bottineau	1486	495	1193	1675	1943	absent	undiffer	2129
2544	162	78	34	SWNW	Bottineau	1493	480	1174	1637	1902	1960	1964	2091
7376	162	79	1	NENW	Bottineau	1500	386	1132	1608	1874	1925	1928	2057
5524	162	79	2	SWNW	Bottineau	1488	392	1129	1620	1875	absent	undiffer	2070
8018	162	79	3	SENE	Bottineau	1502	406	1165	1643	1896	1960	1969	2090
7827	162	79	4	SESW	Bottineau	1487	403	1189	1670	1930	absent	undiffer	2112
4828	162	79	5	SESE	Bottineau	1495	375	1212	1681	1940	2008	2012	2131
9299	162	79	6	NWSW	Bottineau	1496	385	1220	1662	1961	2027	2035	2158
5660	162	79	7	NENW	Bottineau	1491	421	1292	1706	1980	absent	undiffer	2161
3004	162	79	8	NESE	Bottineau	1487	401	1271	1690	1953	2010	2015	2142
5065	162	79	9	SENW	Bottineau	1493	421	1200	1633	1942	2005	2013	2133
9156	162	79	10	SWNW	Bottineau	1494	433	1200	1695	1964	2015	2021	2152
5559	162	79	11	SWNW	Bottineau	1492	410	1168	1640	1896	1956	1962	2090
4676	162	79	12	SENE	Bottineau	1500	441	1200	1645	1911	1972	1980	2117
6417	162	79	15	NENE	Bottineau	1496	410	1190	1670	1931	absent	undiffer	2129
3845	162	79	17	SWSW	Bottineau	1480	412	1245	1675	1978	2040	2048	2173
9277	162	79	24	SWNE	Bottineau	1497	485	1186	1661	1920	absent	undiffer	2112
11618	162	79	27	NENE	Bottineau	1444	n/a	1160	1608	1909	absent	undiffer	2096
2872	162	79	29	SWSW	Bottineau	1474	n/a	1298	1749	2053	2110	2114	2253
3088	162	79	31	NWSW	Bottineau	1492	n/a	1303	1775	2050	2100	2107	2240
2387	162	79	32	NWSE	Bottineau	1480	n/a	1368	1782	2057	2120	2128	2257
2994	162	79	33	NWNW	Bottineau	1480	n/a	1345	1772	2046	2110	2119	2249
7888	162	79	35	NWNW	Bottineau	1443	n/a	1183	1646	1913	1969	1978	2095
3642	162	79	36	NESE	Bottineau	1485	n/a	1203	1643	1946	absent	undiffer	2130
11306	162	80	3	SENE	Bottineau	1596	n/a	1270	1744	2021	absent	undiffer	2228
3325	162	80	4	SESE	Bottineau	1505	n/a	1285	1766	2038	2105	2112	2232
1909	162	80	5	NENE	Bottineau	1505	478	1292	1763	2030	2093	2097	2229
1670	162	80	6	SWNE	Bottineau	1512	490	1321	1798	2075	absent	undiffer	2273
11444	162	80	7	NENW	Bottineau	1509	n/a	1325	1798	2076	2142	2150	2269
3326	162	80	9	SESE	Bottineau	1489	243	1280	1770	2038	2102	2108	2240
5038	162	80	11	NENE	Bottineau	1496	420	1260	1710	2000	2067	2071	2210

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
1324	162	80	14	SWSW	Bottineau	1507	n/a	1338	1773	2046	2100	2107	2240
2925	162	80	16	NENE	Bottineau	1504	267	1297	1780	2042	2107	2111	2223
1588	162	80	17	NESE	Bottineau	1520	270	1310	1787	2058	absent	undiffer	2250
11658	162	80	18	SENW	Bottineau	1506	n/a	1305	1790	2057	2119	2122	2256
8506	162	80	24	SWNW	Bottineau	1495	n/a	1340	1761	2025	2082	2088	2210
3234	162	80	25	SESW	Bottineau	1489	n/a	1292	1735	2040	absent	undiffer	2235
2002	162	80	26	NENE	Bottineau	1494	n/a	1292	1740	2041	2105	2111	2240
6039	162	80	27	NENW	Bottineau	1503	n/a	1310	1790	2068	2121	2129	2260
3377	162	80	28	NESW	Bottineau	1500	n/a	1316	1799	2070	2135	2141	2260
2622	162	80	32	SESE	Bottineau	1500	285	1340	1820	2090	2151	2157	2295
5339	162	81	13	NWNW	Bottineau	1510	500	1330	1791	2056	2120	2129	2260
9287	162	81	15	SWSE	Bottineau	1511	n/a	1372	1855	2129	2197	2199	2348
11244	162	81	30	SWNW	Bottineau	1532	n/a	1305	1940	2218	2288	2292	2447
9834	162	81	31	NESE	Bottineau	1525	n/a	n/a	1932	2212	2292	2298	2450
11243	162	81	32	SWNW	Bottineau	1526	n/a	1280	1910	2191	2250	2260	2417
2699	162	81	33	SWNW	Bottineau	1517	n/a	1260	1890	2170	2235	2240	2400
7765	162	82	1	NWSW	Bottineau	1535	n/a	1375	1898	2170	2239	2241	2391
3197	162	82	2	SWNE	Bottineau	1543	n/a	1375	1898	2170	2235	2240	2391
10591	162	82	5	NENE	Bottineau	1557	588	1442	1971	2245	absent	undiffer	2475
1448	162	82	6	NWNW	Bottineau	1573	650	1560	2011	2287	absent	undiffer	2510
8292	162	82	9	NENE	Bottineau	1549	610	1425	1950	2225	2298	2312	2447
10361	162	82	12	NWNW	Bottineau	1536	n/a	1380	1907	2172	2243	2251	2389
3425	162	82	13	NENE	Bottineau	1528	n/a	1387	1889	2160	2225	2232	2375
1465	162	82	15	SESW	Bottineau	1548	n/a	1500	1945	2223	2296	2305	2451
2676	162	82	17	NENW	Bottineau	1556	n/a	1550	2010	2280	2355	2368	2513
3161	162	82	18	NWNW	Bottineau	1577	n/a	1590	2050	2340	2411	2419	2580
1725	162	82	19	SESW	Bottineau	1574	450	1600	2062	2348	2412	2422	2585
11483	162	82	25	NWSE	Bottineau	1530	370	1440	1930	2212	2271	2283	2434
8800	162	82	26	SESE	Bottineau	1544	n/a	n/a	1965	2250	2330	2335	2496
3508	162	82	33	NWNW	Bottineau	1549	405	1490	2010	2290	2362	2370	2538
12781	162	82	34	SWSE	Bottineau	1543	n/a	1485	1990	2273	2345	2360	2512
11312	162	82	36	NESW	Bottineau	1535	n/a	1445	1959	2240	2310	2322	2470
3465	162	83	4	NWNW	Bottineau	1588	n/a	1580	2095	2367	2438	2453	2605
3454	162	83	5	NWNE	Bottineau	1591	378	1610	2117	2390	2450	2470	2632
4319	162	83	6	NWNE	Bottineau	1591	340	1612	2140	2410	2485	2500	2660
2534	162	83	12	SENW	Bottineau	1589	320	1530	2060	2338	2406	2418	2570
2945	162	83	18	NWNW	Bottineau	1617	n/a	1730	2225	2491	2570	2581	2742
1439	162	83	22	NWNW	Bottineau	1568	n/a	1625	2110	2395	absent	undiffer	2649
8231	162	83	32	SWSE	Bottineau	1602	798	1715	2230	2518	2598	2605	2765
1399	162	83	33	SWNW	Bottineau	1605	n/a	1695	2205	2492	2555	2565	2720
5859	162	83	36	NWSE	Bottineau	1570	n/a	1620	2101	2388	absent	undiffer	2635
3727	162	84	1	SENW	Renville	1610	499	1881	2190	2461	2540	2557	2722
3516	162	84	2	NWNW	Renville	1626	390	1911	2219	2487	absent	undiffer	2735
1450	162	84	9	SENW	Renville	1634	551	1978	2291	2565	2645	2660	2830
10477	162	84	12	NWSE	Renville	1607	n/a	n/a	2182	2480	2560	2573	2726
5568	162	84	13	SWSW	Renville	1614	503	1918	2236	2515	2594	2609	2755
10000	162	84	14	NWNE	Renville	1633	n/a	1722	2251	2523	2610	2628	2772
3280	162	84	15	SESE	Renville	1624	n/a	1735	2288	2570	2645	2665	2805
3992	162	84	17	SWSE	Renville	1654	n/a	1815	2362	2645	2720	2738	2895
8655	162	84	24	NESE	Renville	1620	n/a	1699	2247	2532	2606	2620	2765
1201	162	84	27	NWSW	Renville	1640	n/a	2018	2345	2635	2705	2719	2870
3426	162	85	2	NESE	Renville	1680	n/a	2080	2400	2680	2760	2778	2920
6373	162	85	3	SENE	Renville	1698	560	2018	2433	2704	2780	2794	2950
3799	162	85	10	NESE	Renville	1701	n/a	1915	2451	2725	2810	2827	2972
12228	162	85	12	NWNE	Renville	1687	n/a	1857	2400	2678	2759	2772	2919
3956	162	85	13	SWNW	Renville	1689	n/a	1908	2450	2748	2810	2831	2980
3186	162	85	14	SWNE	Renville	1697	565	1920	2455	2741	2815	2832	2990
4800	162	85	15	SENE	Renville	1713	612	1910	2456	2739	2810	2828	2968
5624	162	85	18	SWNE	Renville	1768	700	2050	2590	2870	2955	2973	3155
2729	162	85	22	SWNW	Renville	1715	665	2135	2519	2805	2880	2895	3048
3600	162	85	24	NENW	Renville	1692	n/a	1905	2445	2736	2815	2838	2985
5953	162	85	29	SWSW	Renville	1768	575	2110	2639	2930	3015	3030	3220
3708	162	85	32	NESW	Renville	1774	775	2155	2665	2959	3041	3051	3240

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
11066	162	85	33	SWSE	Renville	1763	825	2280	2650	2945	3030	3051	3235
3974	162	85	35	SWNW	Renville	1702	726	2100	2535	2825	2910	2930	3125
8278	162	85	36	NWNW	Renville	1710	648	2141	2505	2795	2879	2897	3050
11787	162	86	2	SWSE	Renville	1778	665	2175	2615	2896	2980	2996	3185
5231	162	86	3	SWSE	Renville	1782	730	2087	2611	2890	2975	2991	3170
3953	162	86	4	SWNE	Renville	1753	831	2085	2602	2872	2959	2973	3151
3188	162	86	9	NESW	Renville	1793	800	2160	2690	2973	3060	3076	3240
6330	162	86	11	NESW	Renville	1783	670	2090	2620	2905	2985	3000	3155
5901	162	86	12	SWNW	Renville	1777	715	2076	2610	2899	2975	2990	3182
12756	162	86	15	SESW	Renville	1791	790	2300	2675	2958	3042	3056	3239
3127	162	86	16	SWSW	Renville	1777	761	2365	2695	2980	3065	3080	3265
4167	162	86	19	SENW	Renville	1804	780	2282	2805	3108	3185	3205	3397
3725	162	86	21	NENE	Renville	1795	780	2275	2710	2995	3080	3097	3280
3403	162	86	23	SWNW	Renville	1788	750	2245	2682	2975	3060	3078	3255
12661	162	86	25	SESW	Renville	1777	851	2305	2680	2968	3054	3071	3230
5965	162	86	26	NENE	Renville	1779	740	2350	2682	2975	3060	3079	3240
867	162	86	29	NESW	Renville	1768	n/a	2460	2732	3021	3112	3127	3310
6442	162	86	30	SWNW	Renville	1837	865	2480	2869	3161	3250	3270	3465
11774	162	86	32	SESE	Renville	1801	857	2410	2778	3066	3149	3166	3350
11883	162	86	33	SWNW	Renville	1711	770	2318	2690	2980	3068	3087	3265
10885	162	86	35	SENE	Renville	1781	838	2318	2693	2983	3069	3081	3267
6504	162	87	1	SWNE	Renville	1716	n/a	n/a	2675	2968	3045	3065	3239
5927	162	87	2	SESE	Renville	1805	830	2440	2778	3065	3151	3167	3352
10266	162	87	7	NWNW	Renville	1866	900	2552	2922	3218	3305	3318	3507
11763	162	87	14	SESW	Renville	1852	935	2478	2858	3146	3230	3243	3422
3923	162	87	24	SWSW	Renville	1855	912	2540	2870	3162	3250	3264	3441
1234	162	87	26	SESW	Renville	1856	930	2592	2929	3217	3306	3319	3510
9832	162	87	33	SESE	Renville	1863	962	2599	2972	3262	3351	3367	3555
10265	162	88	5	NESE	Burke	1886	n/a	n/a	3040	3332	3420	3438	3625
12371	162	88	13	NWSE	Burke	1868	1150	2597	2962	3261	3347	3349	3542
10268	162	88	24	NESW	Burke	1863	1230	2647	3014	3310	3395	3407	3606
12552	162	88	26	NESW	Burke	1892	1350	2707	3072	3383	3477	3490	3677
10269	162	88	34	SENW	Burke	1908	1400	2742	3115	3415	3503	3517	3719
1006	162	88	36	NENW	Burke	1872	1285	2628	3043	3334	3427	3432	3620
12221	162	89	1	NENE	Burke	1900	1110	2710	3080	3366	3448	3467	3658
12007	162	89	11	NENE	Burke	1921	1130	2730	3089	3385	3480	3487	3680
3473	162	89	13	SWSW	Burke	1928	1160	2722	3150	3425	3515	3535	3747
3365	162	89	14	SWSW	Burke	1923	1100	2860	3215	3480	3563	3577	3779
3847	162	89	23	SWSE	Burke	1933	1225	2860	3188	3468	3550	3559	3754
14093	163	58	18		Cavalier	1545	n/a	274	643	880	918	990	1053
14094	163	58	27		Cavalier	1532	n/a	245	626	872	901	965	1033
14095	163	59	16		Cavalier	1581	n/a	308	690	924	965	1025	1085
14096	163	60	31		Cavalier	1568	n/a	382	757	1005	1040	1060	1085
4562	163	64	15	SESE	Cavalier	1588	n/a	572	956	1198	1240	1252	n\a
171	163	65	18	NWNE	Towner	1597	450	668	1004	1245	absent	undiffer	1345
4979	163	67	24	SWSW	Towner	1542	n/a	645	975	1223	1286	1299	1342
4554	163	68	6	SESE	Towner	1737	n/a	907	1265	1504	absent	undiffer	1620
434	163	68	27	NWNW	Towner	1713	453	893	1228	1474	absent	undiffer	1610
553	163	69	16	NWSW	Rolette	1868	n/a	1050	1414	1661	1710	1738	1810
579	163	70	3	SWSE	Rolette	1902	n/a	1170	1510	1755	1800	1815	1896
659	163	72	5	NWSW	Rolette	2288	745	1674	2037	2285	absent	undiffer	2429
11018	163	72	17	SWNW	Rolette	2319	870	1650	2067	2304	absent	undiffer	2456
981	163	72	26	SENE	Rolette	2218	680	1548	1954	2204	absent	undiffer	2338
806	163	73	14	NESE	Rolette	2180	680	1583	1958	2206	absent	undiffer	2355
6052	163	73	16	NENE	Rolette	2087	727	1508	1907	2150	absent	undiffer	2300
7377	163	73	22	SENE	Rolette	2101	715	1510	1903	2143	absent	undiffer	2297
6016	163	73	27	NENW	Rolette	2106	720	1499	1900	2142	absent	undiffer	2301
8352	163	73	30	NESW	Rolette	2097	n/a	1518	1928	2171	absent	undiffer	2330
685	163	73	32	SWSW	Rolette	2107	n/a	1458	1866	2118	absent	undiffer	2270
927	163	73	36	NESW	Rolette	2198	n/a	1593	2001	2248	absent	undiffer	2407
1184	163	74	7	NENE	Bottineau	2209	n/a	1671	2072	2317	absent	undiffer	2480
12061	163	74	10	NWNE	Bottineau	2258	652	1681	2087	2319	2381	2405	2492
11046	163	74	20	NESE	Bottineau	2200	n/a	1605	2070	2318	absent	undiffer	2480

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
1673	163	74	23	NESW	Bottineau	2160	534	1614	2005	2244	absent	undiffer	2402
4643	163	75	10	NESW	Bottineau	2145	541	1647	2030	2270	2331	2337	2431
5913	163	75	15	SWNW	Bottineau	2151	540	1657	2050	2299	2370	2373	2462
110	163	75	23	NWNW	Bottineau	2205	n/a	1698	2091	2339	absent	undiffer	2510
10762	163	75	26	NENW	Bottineau	2283	789	1686	2161	2412	2477	2480	2580
503	163	75	27	NESW	Bottineau	2136	554	1650	2055	2295	absent	undiffer	2467
4894	163	75	28	SWSE	Bottineau	2137	595	1637	2046	2282	2341	2362	2442
5023	163	75	32	NENE	Bottineau	2141	649	1565	2068	2301	absent	undiffer	2472
1302	163	76	18	SESE	Bottineau	1723	n/a	1208	1677	1901	absent	undiffer	2080
11128	163	76	19	NWNW	Bottineau	1680	551	1110	1582	1883	absent	undiffer	2057
11060	163	76	30	NESE	Bottineau	1661	472	1101	1584	1888	absent	undiffer	2060
6359	163	76	32	SENW	Bottineau	1679	572	1099	1620	1882	absent	undiffer	2050
11127	163	76	33	SWNW	Bottineau	1698	513	1122	1609	1908	absent	undiffer	2082
12496	163	77	3	NWSW	Bottineau	1620	452	1060	1590	1860	absent	undiffer	2035
12757	163	77	5	NWNE	Bottineau	1573	n/a	1025	1535	1790	absent	undiffer	1961
1528	163	77	7	NWNE	Bottineau	1524	n/a	1031	1545	1801	absent	undiffer	1981
12528	163	77	9	NENE	Bottineau	1609	453	1051	1571	1831	absent	undiffer	2001
4671	163	77	10	NWSE	Bottineau	1633	395	931	1536	1854	absent	undiffer	2026
10649	163	77	11	SENW	Bottineau	1664	400	950	1568	1868	absent	undiffer	2041
11446	163	77	13	SWSW	Bottineau	1685	n/a	959	1582	1885	absent	undiffer	2062
12465	163	77	16	SWSW	Bottineau	1548	n/a	861	1492	1784	absent	undiffer	1960
64	163	77	18	SWNW	Bottineau	1520	n/a	920	1535	1787	absent	undiffer	1960
12575	163	77	20	SENE	Bottineau	1572	421	886	1496	1801	absent	undiffer	1975
12382	163	77	21	SENE	Bottineau	1563	n/a	881	1512	1827	absent	undiffer	1995
504	163	77	22	NENE	Bottineau	1634	n/a	945	1630	1872	absent	undiffer	2048
1426	163	77	25	SWNE	Bottineau	1658	518	937	1615	1880	absent	undiffer	2050
11531	163	77	27	SWSW	Bottineau	1554	430	1135	1550	1820	absent	undiffer	1985
12466	163	77	28	NENW	Bottineau	1537	415	867	1490	1800	absent	undiffer	1972
10452	163	77	29	NENW	Bottineau	1527	n/a	1008	1485	1779	absent	undiffer	1956
9521	163	77	32	NWSW	Bottineau	1521	n/a	1018	1550	1805	absent	undiffer	1985
13606	163	77	33	NENE	Bottineau	1532	n/a	1019	1508	1800	absent	undiffer	1969
2014	163	77	35	NENW	Bottineau	1612	490	n/a	1618	1872	absent	undiffer	2040
4272	163	78	1	NESW	Bottineau	1533	361	1150	1550	1788	absent	n/a	1961
3238	163	78	2	SESE	Bottineau	1523	360	n/a	1551	1799	absent	undiffer	1978
12471	163	78	3	NENE	Bottineau	1538	371	n/a	1532	1816	absent	undiffer	1996
12611	163	78	5	SWNW	Bottineau	1527	390	n/a	1581	1861	absent	undiffer	2052
3320	163	78	6	SESW	Bottineau	1527	391	n/a	1560	1867	1931	1940	2055
1695	163	78	8	SWSE	Bottineau	1528	400	n/a	1610	1868	absent	undiffer	2056
9108	163	78	9	NESW	Bottineau	1526	n/a	n/a	1608	1845	absent	undiffer	2027
10580	163	78	10	NWSE	Bottineau	1525	n/a	n/a	1565	1823	absent	undiffer	2010
10416	163	78	12	SWNW	Bottineau	1523	370	n/a	1542	1795	absent	undiffer	1970
12582	163	78	15	SENW	Bottineau	1526	389	n/a	1580	1832	1896	1900	2022
11940	163	78	17	SWSE	Bottineau	1520	400	n/a	1605	1856	1909	1913	2041
11373	163	78	18	SESE	Bottineau	1521	383	n/a	1610	1875	1929	1935	2068
3482	163	78	19	NESE	Bottineau	1517	400	n/a	1603	1855	1917	1925	2042
12409	163	78	20	SWSE	Bottineau	1517	399	n/a	1595	1850	1910	1917	2038
12408	163	78	21	SWNW	Bottineau	1517	395	n/a	1560	1855	1911	1920	2043
8142	163	78	22	SWNE	Bottineau	1522	380	n/a	1584	1838	1900	1904	2025
1702	163	78	26	NWSE	Bottineau	1508	352	n/a	1578	1818	absent	undiffer	2001
12513	163	78	27	NWSW	Bottineau	1511	411	n/a	1581	1841	1894	1896	2023
12677	163	78	29	NWNE	Bottineau	1511	422	n/a	1600	1857	1915	1921	2045
1788	163	78	30	SWSE	Bottineau	1510	418	n/a	1605	1866	absent	undiffer	2050
12203	163	78	31	NESE	Bottineau	1509	419	n/a	1650	1883	1945	1955	2071
1621	163	78	32	SESW	Bottineau	1510	470	n/a	1642	1877	1936	1942	2071
12281	163	78	33	SESW	Bottineau	1505	433	n/a	1600	1860	1919	1921	2052
834	163	78	34	NWNW	Bottineau	1506	405	n/a	1610	1849	absent	undiffer	2031
3808	163	79	5	SWSW	Bottineau	1492	n/a	n/a	1630	1879	absent	undiffer	2074
9614	163	79	8	SWNW	Bottineau	1496	n/a	1138	1630	1889	1955	1961	2087
5288	163	79	10	SWSW	Bottineau	1498	329	n/a	1620	1875	1939	1947	2068
240	163	79	11	NWSE	Bottineau	1509	355	n/a	1646	1880	1935	1946	2070
4175	163	79	12	SWSW	Bottineau	1519	360	n/a	1620	1865	1926	1932	2060
3182	163	79	13	SWNE	Bottineau	1516	371	n/a	1641	1876	1941	1952	2068
11372	163	79	14	SESE	Bottineau	1512	391	n/a	1609	1861	1926	1931	2063

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
8919	163	79	18	SWSE	Bottineau	1492	369	n/a	1651	1910	1975	1980	2109
5637	163	79	19	NENE	Bottineau	1495	n/a	n/a	1660	1920	absent	undiffer	2122
9988	163	79	20	NENW	Bottineau	1492	n/a	n/a	1648	1908	1971	1978	2107
7793	163	79	21	SESW	Bottineau	1495	368	n/a	1647	1907	1970	1978	2110
8334	163	79	22	NWSE	Bottineau	1510	n/a	n/a	1625	1882	1941	1950	2082
5815	163	79	23	NWSW	Bottineau	1503	392	n/a	1618	1878	1935	1940	2065
9099	163	79	28	SENW	Bottineau	1462	355	n/a	1658	1920	1986	1994	2112
13577	163	79	28	SESE	Bottineau	1501	n/a	n/a	1612	1902	absent	undiffer	2098
921	163	79	29	NENE	Bottineau	1472	n/a	n/a	1655	1895	absent	undiffer	2088
3026	163	79	32	SWSW	Bottineau	1481	n/a	n/a	1670	1920	absent	undiffer	2122
4623	163	79	35	NWNW	Bottineau	1495	370	n/a	1621	1878	absent	undiffer	2076
6151	163	79	36	NESW	Bottineau	1502	411	n/a	1638	1861	absent	undiffer	2051
8241	163	80	1	SESE	Bottineau	1460	n/a	n/a	1649	1888	absent	undiffer	2090
10595	163	80	3	NWNE	Bottineau	1502	n/a	1160	1689	1929	absent	undiffer	2118
4157	163	80	4	NWNW	Bottineau	1502	n/a	1190	1700	1944	absent	undiffer	2135
3889	163	80	5	SENE	Bottineau	1504	n/a	1185	1710	1951	2021	2028	2150
2879	163	80	10	SWSW	Bottineau	1507	n/a	1220	1715	1980	absent	undiffer	2180
8152	163	80	11	SWNW	Bottineau	1504	n/a	1167	1670	1931	1998	2005	2121
564	163	80	13	SWNW	Bottineau	1498	360	n/a	1699	1944	2011	2018	2142
2557	163	80	17	NESW	Bottineau	1506	n/a	1221	1732	1988	2050	2055	2190
2672	163	80	18	NESW	Bottineau	1512	n/a	1240	1747	2010	2076	2080	2212
10726	163	80	19	SESW	Bottineau	1511	n/a	1294	1775	2050	2110	2118	2260
3744	163	80	20	SWNW	Bottineau	1503	n/a	1245	1745	2015	2077	2081	2222
438	163	80	21	NESE	Bottineau	1506	n/a	1220	1718	1980	2047	2051	2180
13588	163	80	22	SWSE	Bottineau	1497	n/a	n/a	1704	2003	absent	undiffer	2209
1956	163	80	24	SESW	Bottineau	1506	400	n/a	1695	1938	1991	1999	2132
3623	163	80	27	SWSW	Bottineau	1502	n/a	1250	1747	2020	2075	2087	2220
5550	163	80	28	SWSW	Bottineau	1505	n/a	1268	1748	2012	2078	2081	2218
248	163	80	29	SENW	Bottineau	1502	n/a	1272	1749	2015	absent	undiffer	2212
2192	163	80	30	SWNE	Bottineau	1507	n/a	1320	1778	2051	2112	2120	2265
3595	163	80	31	NESW	Bottineau	1508	n/a	1310	1779	2055	2115	2119	2256
3765	163	80	32	NWSW	Bottineau	1508	n/a	1290	1761	2029	2095	2100	2230
3499	163	80	34	SWSE	Bottineau	1500	345	1265	1738	2010	2075	2086	2220
1383	163	80	35	SWNE	Bottineau	1494	n/a	1285	1715	1980	2035	2040	2182
10352	163	80	36	NWSW	Bottineau	1497	n/a	1228	1680	1968	2030	2036	2163
9638	163	81	1	NWSE	Bottineau	1508	n/a	1230	1720	1988	2042	2046	2180
9639	163	81	4	SWSW	Bottineau	1522	n/a	1302	1810	2075	2141	2144	2280
11251	163	81	5	NWSW	Bottineau	1521	n/a	1290	1790	2058	2125	2128	2260
8698	163	81	7	SWSW	Bottineau	1522	n/a	1325	1834	2101	2170	2173	2314
4846	163	81	8	NENW	Bottineau	1518	n/a	1300	1805	2070	2130	2138	2278
5251	163	81	9	NWSE	Bottineau	1513	n/a	1300	1790	2060	2125	2130	2270
1839	163	81	14	SENW	Bottineau	1515	n/a	1266	1780	2049	2111	2115	2245
8045	163	81	19	NWSW	Bottineau	1524	n/a	1350	1845	2116	2180	2183	2322
2006	163	81	20	SESE	Bottineau	1516	n/a	1328	1818	2095	2161	2163	2300
5250	163	81	22	SWNE	Bottineau	1519	n/a	1310	1792	2065	absent	undiffer	2260
12483	163	81	23	NESW	Bottineau	1516	n/a	1170	1755	2013	2080	2082	2213
1510	163	81	24	NWSE	Bottineau	1511	n/a	1305	1780	2055	absent	undiffer	2259
11398	163	81	26	NENW	Bottineau	1508	n/a	1295	1770	2035	2102	2105	2243
8635	163	81	27	NESW	Bottineau	1512	n/a	1280	1789	2060	2122	2125	2260
5238	163	81	28	SWSW	Bottineau	1518	n/a	1320	1818	2090	2155	2161	2305
5193	163	81	30	NWNW	Bottineau	1524	n/a	1350	1860	2137	2198	2204	2349
3250	163	81	31	SESW	Bottineau	1522	n/a	1365	1870	2140	2210	2220	2355
3876	163	81	32	NENW	Bottineau	1516	n/a	1341	1841	2122	2180	2185	2330
11924	163	81	33	NWSE	Bottineau	1514	n/a	1320	1820	2091	2160	2163	2300
1920	163	81	35	NENW	Bottineau	1512	n/a	1300	1790	2068	2119	2121	2262
11864	163	81	36	SWSW	Bottineau	1516	n/a	1312	1790	2052	2119	2121	2258
1353	163	82	4	NENE	Bottineau	1545	n/a	1425	1870	2146	absent	undiffer	2355
3726	163	82	5	SWNW	Bottineau	1559	n/a	1470	1915	2187	2255	2275	2400
4114	163	82	7	NWNW	Bottineau	1571	n/a	1495	1945	2218	2285	2292	2440
4378	163	82	8	SESW	Bottineau	1555	n/a	1390	1917	2189	2260	2278	2418
5324	163	82	9	SWNW	Bottineau	1542	n/a	1370	1880	2158	2228	2232	2362
3764	163	82	10	SENW	Bottineau	1542	n/a	1355	1870	2145	2205	2215	2340
11445	163	82	12	SESW	Bottineau	1531	n/a	1320	1835	2103	2175	2181	2312

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
338	163	82	14	NWSW	Bottineau	1530	n/a	1370	1875	2151	2222	2228	2370
4186	163	82	16	SESE	Bottineau	1540	n/a	1450	1890	2158	2230	2242	2375
11646	163	82	17	NWNW	Bottineau	1554	n/a	1408	1930	2208	absent	undiffer	2425
11121	163	82	20	SWSW	Bottineau	1562	588	1412	1950	2221	absent	undiffer	2445
8249	163	82	22	NWSE	Bottineau	1536	500	1370	1878	2151	2220	2230	2368
8319	163	82	24	NWSW	Bottineau	1531	508	1360	1857	2123	2196	2202	2340
4753	163	82	25	NESE	Bottineau	1526	490	1351	1870	2147	2211	2222	2360
3699	163	82	26	SENW	Bottineau	1537	510	1374	1890	2165	2233	2247	2390
11565	163	82	27	SWSW	Bottineau	1545	568	1410	1920	2194	2266	2273	2412
11767	163	82	28	NENE	Bottineau	1546	539	1388	1909	2185	2251	2262	2400
911	163	82	31	NENE	Bottineau	1565	614	1455	1979	2255	2311	2322	2467
3467	163	82	34	NWNW	Bottineau	1545	n/a	1405	1920	2194	2267	2280	2410
8918	163	82	36	SENE	Bottineau	1531	521	1360	1877	2148	2213	2221	2360
5647	163	83	2	NENW	Bottineau	1587	n/a	1475	1990	2258	2329	2341	2480
3640	163	83	3	NENE	Bottineau	1597	n/a	1480	2010	2279	2353	2368	2539
11030	163	83	5	SESW	Bottineau	1611	660	1526	2065	2326	absent	undiffer	2555
5963	163	83	7	NWNW	Bottineau	1618	680	1557	2078	2339	2417	2431	2588
1264	163	83	10	SWSE	Bottineau	1598	619	1580	2030	2298	2370	2387	2540
8321	163	83	11	NESW	Bottineau	1583	550	1495	2009	2280	absent	undiffer	2511
3721	163	83	13	SENE	Bottineau	1571	519	1437	1969	2250	2300	2314	2460
10176	163	83	14	SWSW	Bottineau	1591	608	1500	2038	2311	2377	2398	2532
3074	163	83	15	SESE	Bottineau	1589	590	1510	2045	2320	2407	2417	2585
3770	163	83	16	NWSE	Bottineau	1600	628	1525	2062	2330	2405	2421	2560
3115	163	83	17	SENE	Bottineau	1608	660	1565	2099	2361	2435	2452	2598
6343	163	83	18	SENE	Bottineau	1606	n/a	1570	2102	2370	2445	2461	2599
1325	163	83	20	SESE	Bottineau	1611	n/a	1658	2096	2361	2432	2449	2590
3068	163	83	21	SENE	Bottineau	1581	621	1508	2051	2317	2390	2408	2552
11546	163	83	22	SESW	Bottineau	1576	645	1510	2055	2323	2401	2421	2565
12000	163	83	23	SESE	Bottineau	1584	610	1480	2029	2300	absent	undiffer	2535
1367	163	83	26	SESE	Bottineau	1576	n/a	1540	2035	2305	2379	2391	2544
7598	163	83	26	SWSE	Bottineau	1593	658	1512	2049	2320	2390	2405	2551
10049	163	83	33	SENW	Bottineau	1607	675	1611	2119	2389	2462	2480	2628
6671	163	83	36	NESW	Bottineau	1568	n/a	1600	2042	2315	2385	2397	2535
8842	163	84	1	SWSW	Renville	1628	n/a	1658	2118	2375	2455	2470	2610
5295	163	84	2	SESW	Renville	1625	n/a	1630	2139	2399	2480	2495	2660
3817	163	84	4	NENE	Renville	1635	448	1620	2155	2415	absent	undiffer	2650
11100	163	84	6	NWNW	Renville	1647	790	1728	2225	2490	2572	2585	2722
5290	163	84	7	SWNE	Renville	1644	n/a	1726	2241	2509	2589	2600	2740
12762	163	84	8	NENW	Renville	1631	805	1700	2192	2458	2530	2548	2680
3212	163	84	15	NESE	Renville	1609	697	1625	2140	2408	2485	2500	2641
9624	163	84	16	NESW	Renville	1629	751	1618	2190	2458	2530	2541	2690
5740	163	84	17	NENE	Renville	1635	740	1685	2188	2450	2520	2537	2675
2785	163	84	18	NESE	Renville	1643	n/a	1785	2240	2514	2586	2600	2738
11867	163	84	20	NWSE	Renville	1633	785	1700	2237	2505	2585	2599	2750
10946	163	84	21	SWNW	Renville	1630	745	1670	2222	2488	2570	2586	2728
4693	163	84	22	SWSE	Renville	1619	n/a	1649	2178	2450	2515	2531	2678
11855	163	84	23	NWSE	Renville	1595	670	1635	2129	2388	2460	2470	2626
11399	163	84	25	SWSW	Renville	1622	760	1652	2190	2465	2545	2560	2708
11040	163	84	26	NWSE	Renville	1615	430	1690	2185	2454	2535	2550	2690
7491	163	84	27	SENW	Renville	1620	730	1660	2191	2457	2540	2561	2700
6245	163	84	28	SENE	Renville	1630	n/a	1735	2220	2488	2568	2585	2725
960	163	84	30	SENE	Renville	1642	502	1790	2278	2550	2630	2649	2775
8012	163	84	32	NESW	Renville	1642	n/a	1770	2300	2572	2657	2672	2815
5835	163	84	36	NESW	Renville	1615	n/a	1662	2185	2455	2530	2549	2718
11803	163	85	1	NWSE	Renville	1653	774	1735	2257	2520	2600	2618	2760
3881	163	85	2	NWSE	Renville	1665	n/a	1745	2280	2541	2629	2642	2781
13648	163	85	3	NENE	Renville	1671	n/a	n/a	2278	2542	2628	2632	2782
1726	163	85	3	SENW	Renville	1672	n/a	1810	2295	2554	2638	2650	2790
3675	163	85	4	SESE	Renville	1679	n/a	1840	2317	2574	2660	2680	2815
10410	163	85	5	NWSW	Renville	1710	580	2018	2388	2645	2730	2752	2890
3434	163	85	6	NWNW	Renville	1725	560	2115	2418	2681	2770	2785	2951
3737	163	85	8	NWSE	Renville	1701	n/a	1890	2380	2640	2720	2731	2900
3816	163	85	10	SENW	Renville	1679	815	1770	2302	2560	2645	2660	2797

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
1239	163	85	12	NWSW	Renville	1660	489	1680	2290	2555	2636	2650	2800
10666	163	85	13	NESE	Renville	1654	n/a	1715	2275	2539	2622	2635	2779
3011	163	85	14	NESE	Renville	1659	549	1830	2321	2585	2668	2680	2822
4166	163	85	15	SENE	Renville	1672	582	1830	2321	2585	2668	2680	2822
6458	163	85	17	NESW	Renville	1714	n/a	1868	2417	2680	2760	2775	2962
6123	163	85	18	SWNW	Renville	1736	n/a	1965	2460	2720	2809	2821	2962
3973	163	85	19	NWSW	Renville	1733	621	1982	2478	2747	2825	2840	2980
3253	163	85	20	NESE	Renville	1713	n/a	1920	2418	2689	2765	2776	2926
8636	163	85	21	NENE	Renville	1697	n/a	1850	2387	2650	2735	2752	2895
3806	163	85	23	SESW	Renville	1674	630	1812	2340	2603	2682	2695	2850
11411	163	85	26	SWNW	Renville	1699	n/a	2015	2368	2634	2717	2727	2876
5649	163	85	30	NWNE	Renville	1736	n/a	2122	2475	2745	2830	2844	2989
4165	163	85	32	SENW	Renville	1724	665	2180	2499	2770	2856	2870	3020
11294	163	85	34	SESE	Renville	1694	550	2045	2410	2680	2765	2780	2950
4132	163	85	35	NWNW	Renville	1689	n/a	2080	2391	2665	2750	2768	2912
6410	163	86	2	SWNE	Renville	1750	695	2090	2490	2752	2840	2857	3010
2581	163	86	3	SESW	Renville	1768	n/a	2205	2529	2795	2880	2892	3050
9921	163	86	4	SESE	Renville	1768	650	2230	2547	2815	2885	2902	3040
4839	163	86	9	SWNE	Renville	1775	n/a	2240	2575	2847	2935	2949	3098
4512	163	86	10	SWNW	Renville	1776	660	2220	2551	2815	2897	2908	3068
7473	163	86	11	SWNW	Renville	1752	620	2200	2530	2798	2877	2890	3009
5101	163	86	12	SESW	Renville	1745	505	2160	2465	2730	2805	2815	2960
11585	163	86	13	NWSE	Renville	1748	570	2175	2488	2740	2825	2837	2980
3683	163	86	14	NENW	Renville	1749	605	2198	2520	2797	2876	2891	3041
3599	163	86	17	SWSE	Renville	1760	678	2291	2613	2893	2980	2992	3172
11535	163	86	24	NENW	Renville	1750	680	2128	2501	2769	2852	2867	3010
1040	163	86	26	NWNE	Renville	1785	890	2248	2550	2820	2903	2918	3060
4017	163	86	27	SENW	Renville	1784	688	2235	2620	2890	2979	2996	3152
1822	163	86	29	NENW	Renville	1803	700	2346	2675	2952	3039	3051	3239
12046	163	86	32	NENW	Renville	1802	905	2305	2698	2971	3060	3078	3255
3719	163	86	35	SESW	Renville	1776	738	2280	2600	2880	2962	2975	3135
5592	163	87	2	SENE	Renville	1811	720	2321	2652	2920	3010	3028	3210
6749	163	87	3	NWSE	Renville	1645	n/a	n/a	2510	2790	2873	2888	3086
12043	163	87	4	SENW	Renville	1802	n/a	2371	2679	2958	absent	undiffer	3228
12083	163	87	7	NENE	Renville	1832	820	2379	2738	3019	3109	3118	3335
6401	163	87	10	NESW	Renville	1703	n/a	n/a	2605	2875	2965	2975	3150
5556	163	87	11	SENE	Renville	1810	732	2332	2643	2919	3008	3024	3217
5834	163	87	12	SESW	Renville	1805	842	2355	2677	2952	3041	3050	3252
8533	163	87	13	NENE	Renville	1804	700	2335	2668	2941	3032	3042	3236
12497	163	87	22	SENW	Renville	1810	747	2420	2741	3020	3111	3126	3309
3912	163	87	24	NESE	Renville	1803	745	2355	2690	2978	3060	3080	3270
10263	163	88	1	NWSW	Burke	1861	890	2447	2815	3085	3170	3182	3384
9424	163	88	8	NENW	Burke	1867	890	2520	2878	3148	3249	3249	3444
1080	163	88	11	SESE	Burke	1870	860	2551	2860	3140	3230	3240	3432
1490	163	88	31	SESE	Burke	1895	1050	2630	3050	3342	3435	3440	3650
10264	163	88	34	NWSW	Burke	1866	730	2607	2975	3270	3358	3372	3562
10382	163	89	11	NWNW	Burke	1872	932	2567	2922	3193	3280	3296	3487
2800	163	89	13	SWNW	Burke	1887	932	2628	2951	3207	3310	3317	3508
1428	163	89	15	NESE	Burke	1895	938	2625	2980	3265	3344	3347	3538
4526	163	89	27	SESE	Burke	1925	983	2768	3072	3358	3445	3460	3650
2653	163	89	35	SWSW	Burke	1915	1000	2753	3058	3345	3424	3434	3630
569	164	70	31	SWNW	Rolette	1919	n/a	1300	1628	1872	absent	undiffer	2010
359	164	74	36	SWSE	Bottineau	2256	634	1645	2065	2308	absent	undiffer	2462
1411	164	76	31	NESE	Bottineau	1846	n/a	1320	1793	2027	absent	undiffer	2204
10318	164	77	28	SWSW	Bottineau	1583	n/a	1030	1578	1818	absent	undiffer	n\a
5127	164	77	30	SWSW	Bottineau	1541	341	n/a	1538	1790	absent	undiffer	1962
10043	164	77	33	NWNE	Bottineau	1598	410	n/a	1551	1810	absent	undiffer	1983
4818	164	77	35	NESW	Bottineau	1702	n/a	n/a	1652	1895	absent	undiffer	2072
9313	164	78	25	SWSE	Bottineau	1538	n/a	n/a	1538	1790	absent	undiffer	1966
11909	164	78	27	SWSE	Bottineau	1546	n/a	n/a	1599	1856	absent	undiffer	2040
10304	164	78	32	NWSW	Bottineau	1531	360	n/a	1592	1847	absent	undiffer	2031
10552	164	78	33	SESW	Bottineau	1536	n/a	n/a	1590	1840	absent	undiffer	2024
10251	164	78	34	SENE	Bottineau	1540	356	n/a	1562	1811	absent	undiffer	1985

WELL#	TWP	RNG	SEC	QTR	COUNTY	KB	KP	KN	KG	KM	KNWC	KSC	KIK
11461	164	78	36	SWNE	Bottineau	1536	357	n/a	1494	1788	absent	undiffer	1965
3775	164	79	32	SENE	Bottineau	1492	n/a	n/a	1610	1858	absent	undiffer	2049
5349	164	79	33	SENE	Bottineau	1509	n/a	1170	1640	1875	1938	1944	2074
11627	164	79	34	NWNE	Bottineau	1510	330	n/a	1612	1864	1931	1938	2060
3481	164	79	35	NWSE	Bottineau	1517	n/a	n/a	1640	1869	1935	1942	2065
11662	164	79	36	NWNW	Bottineau	1528	n/a	n/a	1600	1851	absent	undiffer	2042
3593	164	80	32	SWNW	Bottineau	1506	n/a	1241	1700	1951	2004	2010	2130
9966	164	80	34	SWSW	Bottineau	1507	331	1150	1698	1932	1990	2000	2125
10462	164	80	35	SWNE	Bottineau	1495	300	1133	1674	1903	1970	1973	2100
1470	164	81	27	SWSE	Bottineau	1511	n/a	1245	1730	1988	absent	undiffer	2182
4780	164	81	33	SENE	Bottineau	1519	n/a	1248	1748	2004	2072	2075	2210
1149	164	81	36	NWNE	Bottineau	1507	n/a	1252	1720	1968	2038	2040	2167
5652	164	83	29	SWSW	Bottineau	1612	468	1748	2020	2280	2355	2377	2532
3949	164	83	30	NWNE	Bottineau	1612	n/a	1755	2028	2278	2365	2383	2538
4029	164	83	31	NENW	Bottineau	1619	n/a	1768	2051	2318	2390	2408	2562
13566	164	83	31	SWNE	Bottineau	1616	n/a	1768	2048	2300	2387	2398	2550
13536	164	83	32	SENE	Bottineau	1609	n/a	n/a	2027	2308	absent	undiffer	2538
8946	164	83	32	SWSE	Bottineau	1610	630	1751	2062	2335	2398	2413	2560
8284	164	83	33	SESE	Bottineau	1592	570	1731	2028	2291	2368	2375	2518
8216	164	83	34	SESE	Bottineau	1589	560	1625	2005	2268	2347	2351	2495
4156	164	83	35	NESW	Bottineau	1586	550	1670	1980	2248	2312	2328	2480
9673	164	84	26	SWSW	Renville	1624	545	1620	2099	2369	2440	2452	2621
9229	164	84	28	SESW	Renville	1637	680	1760	2147	2405	2482	2492	2640
7684	164	84	30	SWSW	Renville	1643	n/a	1850	2200	2457	2530	2547	2690
9305	164	84	31	NWSW	Renville	1647	n/a	1890	2225	2482	2567	2580	2715
8120	164	84	32	NENE	Renville	1640	n/a	1870	2178	2433	2518	2529	2675
13533	164	84	33	NENW	Renville	1639	n/a	n/a	2137	2412	absent	undiffer	2640
5800	164	84	33	NWSW	Renville	1642	n/a	1890	2180	2438	2505	2518	2670
12639	164	84	34	SENE	Renville	1627	n/a	1639	2118	2379	2456	2467	2612
8989	164	84	36	NWSW	Renville	1623	n/a	1730	2094	2355	2415	2430	2589
12733	164	85	28	SWSE	Renville	1682	n/a	1930	2273	2529	2614	2628	2780
9980	164	85	29	SESE	Renville	1696	472	2005	2290	2549	2621	2630	2788
2656	164	85	30	SESW	Renville	1715	508	2082	2390	2645	2728	2740	2912
5926	164	85	31	SWNE	Renville	1710	588	2074	2385	2648	2730	2742	2899
5451	164	85	33	NWSE	Renville	1680	n/a	1920	2287	2531	2618	2625	2788
12805	164	85	34	NENE	Renville	1673	n/a	1908	2265	2521	2605	2616	2753
12764	164	85	35	SWNE	Renville	1665	n/a	1890	2250	2497	2583	2597	2740
12456	164	85	36	NESW	Renville	1653	n/a	1912	2230	2492	2580	2596	2726
4200	164	86	29	SWSE	Renville	1789	680	2216	2530	2791	2880	2891	3032
9637	164	86	30	SESW	Renville	1797	703	2278	2598	2861	2949	2963	3115
3629	164	86	33	SESE	Renville	1770	698	2203	2525	2778	2865	2882	3028
3826	164	86	34	NWNW	Renville	1762	638	2185	2506	2768	2851	2868	3037
3906	164	86	36	SWNW	Renville	1737	n/a	2150	2470	2732	2818	2832	3008
6561	164	87	32	SENW	Renville	1803	688	2270	2665	2925	3018	3031	3230
6349	164	87	34	SWSW	Renville	1636	n/a	n/a	2500	2772	2855	2866	3030
6022	164	87	35	NENE	Renville	1807	710	2315	2630	2905	2990	3005	3185
10262	164	88	31	NWSE	Burke	1860	920	2500	2850	3121	3212	3215	3414
8841	164	88	34	SESW	Burke	1872	n/a	2540	2850	3128	3214	3218	3425
10423	164	88	36	SESW	Burke	1867	n/a	2440	2795	3072	3168	3175	3375

APPENDIX B - CORE DESCRIPTION

Whole Cores

Well No.: 4592
Operator: E. C. Johnston Jr.
Name: Kleven #1-A
County: Burleigh
Location: 140N-80W-18-SWSW

Interval:	Description:
	Mowry Formation
2881-2891	Shale, dark gray, blocky, bioturbated throughout, becoming siltier with depth, dolomite/limestone pebbles at base of interval.
	Newcastle Formation
2891-2896	Sandstone, light gray, very fine-grained , clay-rich, bioturbated, friable, wavy parallel laminations, ripple marks?, small coal chips (5-10 mm) scattered throughout interval.
2896-2900	As above, fine-grained sandstone, contorted bedding, thin laminations of coal chip accumulations, burrows? in-filled with very clean, very light gray sandstone, well indurated.
2900-2911	As above, trough cross-bedding?, soft sediment deformation throughout, friable, becoming increasingly clay-rich.
2911-2918	As above, becoming very fine-grained, clay and silt content increasing.

Well No.: 5679
Operator: Kelsch & Donlin, Inc.
Name: Huber No. 3
County: Emmons
Location: 133N-74W-2-NWNW

Interval:	Description:
	Newcastle Formation
2335-2347	Sandstone, very fine-grained, light gray, clay-rich, friable. Cross-bedded, scattered clay clasts (ripups?) throughout interval.
2347-2354	No Core
2354-2355	As above, interbedded with shale, dark gray, clay-rich, fissile.
2355-2358	Shale, very dark gray to black, clay-rich, fissile
2358-2364	Sandstone, very fine-grained, light gray, muddy, cross-bedded, contorted bedding, soft sediment deformation, ripple marks?
2364-2373	Mudstone, dark gray, blocky, moderately burrowed, soft sediment deformations
2373-2376	As above, increasingly siltier, slightly burrowed
2376-2383	Claystone, dark gray, burrowed?

Well No.: 4706
Operator: Ladd Petroleum Corporation
Name: Herman #1
County: Mercer
Location: 144N-90W-17-NWNE

Interval:	Description:
	Newcastle Formation
4573-4589	Sandstone, very light gray, fairly clean, quartz-rich, medium to fine-grained, micaceous, friable, very porous and permeable. Contains several 3-6 cm zones of thinly interbedded sandstone and shale, dark gray, clay-rich, bioturbated, soft sediment deformations. Increasingly bioturbated with depth. Several very coarse-grained lenses in the interval between 4584-4585.
4589-4590	As above. Becoming shalier with depth, scoured, cross-bedded?, moderately bioturbated.
4590-4597	As above. Continued increase in shale content downward, highly bioturbated.

Well No: 5681
Operator: Kelsch & Donlin, Inc.
Name: Grunfelder No. 1
County: Emmons
Location: 134N-74W-9-SWNW

Interval:	Description:
	Newcastle Formation
2216-2222	Sandstone: light gray, very fine-grained, micaceous, quartz-rich, interbedded with shale: black, clay-rich, coal fragments scattered throughout. Interbeds 2-8 cm thick, rip-ups of shale present within sandstone layers, ripple marks?, soft sediment deformation.
2222-2224	As above, becoming significantly shalier, bioturbated?, sharp contact of sandier units above with this shale-rich unit.
2224-2225.5	Sandstone: very coarse-grained, several zones 2-6 cm thick of Fe-oxide staining, nearly impermeable within these zones, presence of coal fragments and unknown rip-ups near base of interval.
2225.5-2228	Same as interval 2216-2222. Slightly more bioturbation.
2228-2235	As above. Sandstone beds becoming thicker, more abundant than shale beds.
2235-2240	Shale: black, clay-rich, blocky, becoming siltier with depth, coal fragments present within muddier base of interval, bioturbated, plant fragments well preserved, rip-ups?, in sharp contact with overlying interval.
2240-2245	Sandstone: fine-grained, very dirty, friable, highly permeable, micaceous, several coal fragments near top of interval.
2245-2246	Interbedded sandstone (as above), shale: dark black, clay-rich, and mudstone: medium gray. Interval bioturbated?, soft sediment deformation.
2246-2247.5	Sandstone: fine-grained, light gray, dirty, well indurated, interbedded/finely laminated with organic rich layers: silt-clay size grains, dark brown to black. Fe-oxide stained throughout interval, very dense, heavy mineral concentration?, sharp contact with overlying interval.
	Skull Creek Formation
2247.5-2252	Mudstone: medium gray to brown, dirty, interbedded with shale: dark gray to black, clay-rich, blocky. Highly bioturbated throughout interval, ripple marks?, sharp contact with overlying interval.

Well No: Strat Test
Operator: Westcoast Oil & Gas et al.
Name: Westcoast et al. State No. 1
County: Emmons
Location: 133N-75W-36-SESE

Interval:	Description:
	Newcastle Formation
2193-2196	Sandstone: light gray, medium to coarse-grained, cross-bedded?, abundant nodules?: round, 1-3 mm diameter, Fe-oxide cemented quartz grains. Small. 1-3 cm, concretion?, Fe-oxide stained, very dense, hard, dark yellowish-brown. Interval overall well indurated, noticeable lack of biologic activity.
2196-2199	Sandstone: light gray, fine-grained, interbedded with mudstone: dark gray to brown, bioturbated throughout, burrows in-filled with very clean, fine-grained, quartz sandstone, rip-ups? near base of interval.
2199-2201	As above. Lack of rip-ups.
2201-2213	(Only 2 feet of actual rock recovered for this interval) Shale: black, clay-rich, slickensides present throughout.

Well No: Strat Test
Operator: Westcoast - Kelsch & Donlin
Name: Fischer No. 1
County: Emmons
Location: 132N-75W-15-SWSW

Interval:	Description:
	Newcastle Formation
2120-2121	Mudstone: light gray, bioturbated, burrows in filled with fine-grained sandstone, horizontal and vertical burrows present, large amount of fish scales?, fish bones?.
2121-2124	Mudstone, as above, interbedded with sandstone: fine-grained, quartz-rich, highly bioturbated, soft sediment deformation?, fish fossils from above abruptly absent, coal fragments present throughout, sandier and more blocky at top of interval, becoming muddier with depth.
2124-2139	Sandstone: light gray, fine-grained, very dirty, micaceous, interbedded (1-5 mm) with mudstone, dark gray, moderately bioturbated, cross-bedding?, soft sediment deformation, coaly fragments concentrated into thin laminae, light green sand in places scattered throughout, petroliferous where greenish sand is found.
2139-2140	No Core.

2140-2142	As above, very friable sandstone, becoming increasingly sandier downward, high concentration of coal fragments throughout interval, concentrated in thin laminae, concretion?/nodule?: red-brown, very dense, sand grains coated with stain, cementing interval total thickness 5-6 cm.
2142-2143	As above, sharp increase in percentage of mudstone with depth throughout interval, coal fragments as laminae concentrations throughout, becoming predominantly siltstone at base of interval.
2143-2144	Siltstone, nearly shale, dark gray to black, fish scales?, shell fragments?, trace of coal fragments scattered throughout interval.
2144-2149	No Core.
2149-2176	Shale: dark gray, clay-rich, slightly bioturbated, fine-grained sandstone in filling burrows, rather featureless, scattered fish scales?, coal fragments sparsely scattered throughout interval.
2176-2181.5	Mudstone: light gray, slightly micaceous, noticeable increase in number and size of coal fragments, randomly oriented, scattered unevenly throughout, no longer in laminar concentrations, various recognizable leaf and wood fragments, slickensides present throughout interval, several zones of brown organic? staining throughout, does not fluoresce, surficial stain, does not penetrate entire core thickness, blocky lumpy appearance of entire interval.
2181.5-2188	Sandstone: fine to medium-grained, light gray, abundant coal fragments smaller, in concentrated laminar zones 1-5 mm thick, rip-ups?, burrowed, thin laminae of shale: dark black, clay-rich, scattered throughout, cleaner sand than above units, several concretions?, "halos" of red-brown stained sandstone surrounding greenish-brown nodules.

Well No:	Strat Test
Operator:	Westcoast - Kelsch & Donlin
Name:	Wald No. 1
County:	Emmons
Location:	131N-75W-21-SWSW

Interval:	Description:
	Mowry Formation
2233-2235	Shale: dark gray, blocky, clay-rich.
2235-2237	Shale: light gray, blocky, increasing in silt/sand content with depth, micaceous, several thin sand lenses interbedded near base.
2237-2242	Shale: same as interval 2233-2235
2242-2248	Shale: light gray as above interbedded with sandstone: very fine-grained, micaceous, bioturbated, abundant coal fragments scattered throughout, grain size increasing with depth, as is coal content.

2248-2251	No Core.
2251-2254	Mudstone: light gray, micaceous, extremely fissile, coal fragments/ organic matter abundant, clay/shale rip-ups? near base of interval, waxy slickensides present throughout interval.
	Newcastle Formation
2254-2260	Sandstone: very fine to fine-grained, light gray, micaceous, blocky, sharp contact with above interval, less organic content/coal than above.
2260-2271	Sandstone: fine to medium-grained, light gray, dirty quartz-rich, extremely friable, scattered coaly fragments throughout, becoming finer-grained with depth, bioturbated?, Interval of 2270.5-2271: very dense, heavy, non-porous sandstone, Fe-stained, heavy minerals present (Concretion/nodule?)

Well No:	Strat Test
Operator:	Westcoast - Kelsch & Donlin
Name:	Weber No. 1A
County:	Emmons
Location:	133N-76W-35-NESE

Interval:	Description:
	Mowry Formation
2269-2284	Shale: light gray, clay-rich, blocky, several silty zones throughout, slightly burrowed, well indurated.
2284-2289	As above, becoming siltier, highly bioturbated, soft-sediment deformation abundant, burrows in-filled with fine-grained sand, light green, sand also occurring as thin interbeds near base of interval.
2289-2294	As above, becoming siltier, more interbedded with sand, shale becoming very dark black, soft overall.
	Newcastle Formation
2294-2301	Siltstone: dark gray to black, grading into sandstone: fine to medium grained, quartz-rich, dark gray, large (1-2 cm) coal fragments scattered throughout.
2301-2323	Sandstone: dark gray, fine to medium-grained, quartz-rich, cleaner than above, fewer coal fragments present, friable, cross-bedding? present throughout, several lenses containing 1-3mm round BB-like concretions.

Skull Creek Formation

2323-2330	Shale: dark gray, clay-rich, interbedded with mudstone: light gray, silty, blocky, interval burrowed, high amount of soft-sediment deformation.

Well No: Strat Test
Operator: Westcoast - Kelsch & Donlin
Name: Hansen No. 1
County: Emmons
Location: 133N-75W-29-SENE

Interval:	Description:
	Newcastle Formation
2240-2245	Shale: black, clay-rich, interbedded with sandstone: fine-grained, dirty quartz-rich, interval thinly laminated overall, increasing in sand content with depth, soft-sediment deformation present throughout, bioturbated, burrows in-filled with sand, scattered coal fragments 1-1.5cm throughout, units becoming lighter in color with depth.
2245-2246.5	As above, sharp increase in sand content, very dense, heavy, Fe-stained concretion? present as described in other cores.
2246.5-2250.5	Mudstone: light gray, silty finely interbedded with sandstone: very fine to fine-grained, as above, few coal fragments present, several small (2-3cm) concretions?, soft-sediment deformation abundant, bioturbated throughout.
2250.5-2259.5	(Interval highly chaotic within core box, mixed up, not labeled) Appears to resemble above interval, becoming coarser-grained with depth.
2259.5-2262.5	As above, becoming cleaner with depth, lack of coal fragments, slightly burrowed.
2262.5-2263	Accumulation of small (0.5-3cm) irregular-shaped fragments, resemble concretion-like material of interval 2245-2246.5, randomly oriented, poorly sorted, lag deposit?, storm deposit/rip-ups?, lens surrounded by mudstone above and below.
2263-2265.5	Mudstone: light gray grading into sandstone: fine-grained, light gray, increased bioturbation, soft-sediment deformation present, several zones of Fe-stained grains resembling early stages of above concretions.
2265.5-2267.5	Concretion: 10-12 cm thick, as above, medium-grained sand, Fe-stained, dense, surrounded by mudstone above and below, light gray, high amount of coal fragments present, thin interbeds of fine-grained sand present throughout, slightly bioturbated.
2267.5-2270	Interbedded sandstone and mudstone as above, with shale, dark gray, within shale interbeds several shell fragments present, coal fragments concentrated in laminae throughout, becoming increasingly shalier with depth.

Skull Creek Formation

2270-2274.5	Shale: light gray, clay-rich, slightly burrowed, in-filled with sand of above interval, several small (1-5mm) shell fragments?, fish scales? scattered throughout.

Well No: 5369
Operator: R.K. Petroleum Co.
Name: Ervin Hanke No. 9-14
County: Oliver
Location: 142N-85W-14-NESE

Interval:	Description:
	Newcastle Formation
3750-3755	Blocky shale, lenticular sandstone blebs, coarsening downward into very fine-grained shaley sandstone.
3755-3757	Fine to medium grained sandstone, shale chips, thin coaly lamination, moderately burrowed.
3757-3767	Medium grained sandstone, dolomite pebbles in thin zone 4-6" above sharp contact into much cleaner sandstone, very few scattered shale chips.
3767-3773	Medium grained sandstone, scoured contact with above interval, brown clay drapes, thin coaly lamination in clusters, thin layer of clean sandstone scoured into dirty layers - with coals, clays, etc.
3773-3775	Medium grained sandstone, very clean and tight, large clay chips, scoured boundaries.
3775-3778	Medium grained sandstone, clay chips, coaly fragments, like interval 3767-3773.
3778-3785	Coarse grained sandstone, scoured contact with above, very clean, very featureless, some scours present.
3785-3786	Sandy shale, muddy, transition zone.

Chip Cores

Well No.: NR-11
Company: Northern Resources Incorporated
Name: Patton
County: Ramsey
Location: 156N-61W-27-SWSW

Interval:	Description:
	Newcastle Formation
1162-1168	Light gray, very fine-grained quartz sandstone, very finely interbedded with darker gray silt and mud, 0.1-0.5cm thick interbeds, burrowed.
1168-1178	As above, becoming more interbedded with finer interbeds, also finer grained, nearly mud.
1178-1182	As above, very featureless overall, slightly coarsening-upward sequence.

Well No.: NR-1
Operator: Northern Resources Incorporated
Name: Alf J. Overby
County: Steele
Location: 146N-57W-9

Interval:	Description:
	Newcastle Formation
775-793	Entire interval mudstone, burrowed?, very featureless, becoming increasingly sandier with depth.

Well No.: NR-2
Operator: Northern Resources Incorporated
Name: Arneson
County: Steele
Location: 147N-57W-31-SWSW

Interval:	Description:
	Mowry Formation
920-942	Dark gray shale, clay rich, blocky.

Newcastle Formation

942-960	Dark gray mudstone, becoming increasingly silty with depth, bioturbated, highly interbedded with light gray very fine-grained to fine-grained quartz sandstone.
960-980	As above, with large amount of coaly fragments in interval 965-970.

Well No.: NR-10
Operator: Northern Resources Incorporated
Name: Legacy
County: Ramsey
Location: 156N-60W-20-SWSW

Interval:	Description:
	Newcastle Formation
1135-1148	Entire interval: Light gray very fine-grained sandstone interbedded with dark green shale, clay rich, becoming more shaley with depth, wafer-thin chips that are very friable, featureless, entire interval is very finely interbedded.

Well No.: NR-3
Operator: Northern Resources Incorporated
Name: Johnson
County: Griggs
Location: 147N-58W-3-SWNE

Interval:	Description:
	Newcastle Formation
1022-1037	Dark gray mudstone to very fine-grained sandstone, organic (coaly) fragments present near base.
1037-1081	No Core.
1081-1083	Light gray, fine-grained sandstone, very micaceous, featureless.
1083-1084	Dark gray, fine-grained sandstone, abundant coaly fragments.
1084-1088	Light gray, very fine-grained sandstone, as in 1081-1083
1088-1126	Light gray, very fine-grained sandstone to mudstone, clay rich, micaceous, burrowed?
1126-1141	Light gray sandstone as above interbedded with dark gray mudstone, interbedded light olive green clay/ silty interval 1030-1032, becoming shalier with depth.

Well No.: NR-9
Operator: Northern Resources Incorporated
Name: Reiten
County: Nelson
Location: 151N-58W-10-SENWSE

Interval:	Description:
	Newcastle Formation
1028-1031	Light gray, very fine-grained sandstone, micaceous, burrowed, contains dark gray mudstone clasts, rip-ups?
1031-1039	Dark gray mudstone, clay rich, bioturbated, burrows filled in with light gray, very fine-grained sandstone as above.
1039-1065	Very light gray, very fine-grained sandstone to siltstone, interbedded with dark gray shale, several organic-rich layers with coaly fragments, very muddy sandstone, mudstone.
1065-1067	Olive green, fine to medium-grained quartz sandstone, very friable, micaceous, glauconitic.
1067-1073	Interbedded dark gray mudstone and light gray, fine to medium-grained sandstone, burrowed?
1073-1099	Fine to medium-grained quartz sandstone, light gray to dark olive green, very micaceous (biotite/muscovite), very friable, dark green color may be glauconite?

Well No.: NR-17
Operator: Northern Resources Incorporated
Name: Kuchar
County: Ramsey
Location: 158N-60W-30-NWNW

Interval:	Description:
	Mowry Formation
1042-1062	Dark gray shale, clay rich, small specks of sandstone increasing with depth.
1062-1065	Dark gray mudstone, interbedded/ bioturbated with light gray, very fine-grained to fine-grained quartz sandstone, coaly fragments scattered throughout, burrowed.
	Newcastle Formation
1165-1167	Dark gray to black shale, clay rich, slightly interbedded with above sandstone, infilling of burrows.

1167-1174	Dark gray mudstone, interbedded with light gray to olive green, fine-grained sandstone, becoming medium-grained with depth, more sandstone than shale/ mudstone with depth, coaly fragments in interbedded lenses, becoming less bioturbated with depth.

Well No.: NR-32
Operator: Northern Resources Incorporated
Name: Erickson
County: Steele
Location: 147N-57W-7-SESWSW

Interval:	Description:
	Newcastle Formation
1050-1063	Light gray, very fine-grained sandstone, micaceous, interbedded with dark gray mudstone/shale, bioturbated, becoming siltier with depth.
1063-1082	No Core.
1082-1090	Light gray mudstone, micaceous, high organic content, clay rich.
1090-1092	Dark gray, clay rich shale, featureless.
1092-1107	Interbedded mudstone/sandstone: mudstone dark gray as above, light gray very fine-grained sandstone, micaceous, interbedded and bioturbated throughout, scattered 0.5-1.0 cm coaly fragments present.
1107-1109	Dark gray shale, clay rich, same as above.
1109-1141	Same as interval 1092-1107.

Well No.: NR-28
Operator: Northern Resources Incorporated
Name: Lockan
County: Nelson
Location: 150N-57W-27-NWNW

Interval:	Description:
	Greenhorn Formation
951-956	Very fine-grained sandstone in burrows within siltstone, micaceous, burrowed, light gray with buff sandstone in fills.
	Mowry Formation
956-968	Interbedded dark gray shale and siltstone, burrowed, becoming more clay rich with depth.
968-981	Same as above with less burrowing, more clay rich overall.
981-999	Dark gray to black shale, clay rich, silty zones within, micaceous.

999-1000	Very fine-grained sandstone interbedded with shale from above, abundant coaly fragments in layers within sandstone, less than 1.0 cm, burrowed?
	Newcastle Formation
1000-1020	Very light gray to buff, very fine-grained sandstone, clay rich, darker gray clasts scattered throughout (rip ups?).
1020-1040	Light to medium gray siltstone to shale with very dark coal-like organic clasts near top, slightly burrowed, sulfur-rich at base.
1040-1060	Very light gray to buff mudstone/claystone, burrowed, finely laminated with siltstones, blocky character.
1060-1063	Dark gray mudstone, blocky, coaly fragments present, several large (2-4cm) fragments of coaly material, very dark organic color overall.
1063-1078	Dark olive green claystone/mudstone interbedded with very fine-grained sandstone, coarsening with depth, micaceous, small (1-2cm) coal fragments throughout, very thinly laminated sequences.
1078-1098	Very thinly laminated, very fine-grained sandstone with dark gray shale; sandstone is like above interval, clay rich, burrowed?, slight amount of coal fragments scattered throughout, less than above.

Well No.:	NR-15
Operator:	Northern Resources Incorporated
Name:	Malmin
County:	Ramsey
Location:	157N-60W-10-NENESW

Interval:	Description:
	Newcastle Formation
1119-1123	Dark gray, clay rich shale interbedded with light gray, very fine-grained to fine-grained quartz sandstone, micaceous, burrowed throughout.
1123-1124	Light gray, fine to medium-grained quartz sandstone, coaly fragments (0.5-1.0cm) present throughout, very well indurated.
1124-1126	Dark gray shale, clay rich
1126-1130	Light gray to olive green, very fine-grained sandstone interbedded with dark gray shale as above, highly bioturbated.
1130-1143	Light gray mudstone to very fine-grained sandstone, interbedded, burrowed.
1143-1149	Same as above
1149-1153	Dark gray, clay rich shale, featureless.
1153-1157	Light gray, fine to medium-grained quartz sandstone, slightly interbedded with dark gray mudstone, burrowed.

Well No.: NR-4
Operator: Northern Resources Incorporated
Name : Nesheim
County: Griggs
Location: 147N-58W-14-SWSESW

Interval:	Description:
	Newcastle Formation
912-953	Entire interval: dark gray mudstone, burrowed, infilled with light gray, very fine-grained quartz sandstone, muddy overall, featureless.

Well No.: NR-X
Operator: Northern Resources Incorporated
Name: Severson
County: Walsh
Location: 156N-59W-9

Interval:	Description:
	Mowry Formation
1084-1105	Dark gray to black shale, clay-rich, featureless, blocky.
	Newcastle Formation
1105-1110	Dark gray mudstone interbedded with light gray quartz sandstone, coarse-grained at top, fining downward, burrowed, becoming light green to olive-colored with depth.

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